ENGINEERING NEWS.

Tribune Building, New York City.

GEO. H. FROST, PROPRIETOR.

SATURDAY, ARPIL 9, 1881.

WE will supply two orders for Drinker's Tunneling at $25 per copy net cash; at just what date the new edition will be out is very problematical, certainly not for several months to come.

THE SEWERAGE OF MANHATTAN BEACH HOTELS.

The sewage of the Manhattan Beach Hotel during the past two seasons was discharged into Sheepshead Bay, nearly opposite the hotel. The pollution of the water became such as to cause complaints to be made by the people living on the opposite shores of the bay, and those using the waters of the bay for boating and other purposes. With the opening of the Oriental Hotel the evil was likely to be increased, and the complaints became louder and more frequent. The Manhattan Improvement Company, therefore, instructed their Chief Engineer, Mr. Henrique Harris, to spare no expense in obtaining the best method of effectually disposing of the hotel sewage so as not to endanger the health of the people in the vicinity, nor to annoy them. Mr. Harris thereupon changed the outlet of the sewer to a point in the bay one mile nearer the opening to the ocean, erected cribwork, a screen to intercept the rags, etc., carried down the sewer, and a gate to hold back the sewage to a proper stage of tide for discharging it so as to insure its being carried out to sea. The sewer worked perfectly; but the average supervisor is not to be easily placated, and insisted in stirring up the sewage of the great caravanseries and airing certain little engineering fancies of home invention. Mr. Harris invited a party of engineers to visit the the Beach last week and inpect the obnoxious system, asking them to report "whether the system applied and the location of the outlet of the sewer will tend to pollute the waters of Sheepshead Bay, bringing disease to its people, or if it will be harmless in a sanitary point of view."

The engineers whose names are appended to the following certificate went over the ground sufficiently to inform themselves upon the merits of the system, and two days after signed the following opinion:

NEW YORK, March 31, 1881.

Henrique Harris, Esq., C. E., 212 Adelphi St., Brooklyn, N. Y.

SIR: Having on 29th inst., at your request and in your company, inspected the works constructed by you for the conveyance and discharge of the sewage of the Manhattan Beach and Oriental Hotels at Coney Island, and having been fully informed by you as to the manner of application of the various devices used in connection therewith, we find the facts as to these works to be as follows:

1st. The sewers are ample in capacity to meet any demands likely to be made on them, and the contingency of heavy rainfall seems to have been abundantly provided for. The Manhattan Beach Hotel sewer is 12" diam., and the sewer common to that and the Oriental Hotel is 18" diam.

2d. The arrangements for flushing and cleaning the main sewer are complete, and should be effective. A water pipe leading from a pump on the main land, and connecting with tanks in the attic of the Oriental Hotel, is laid parallel with the sewer, and is provided with a number of openings to communicate with the same, besides which the sewer is fitted with numerous hand-holes.

3d. The sewer terminates at a distance of 2,800 ft. (about) from the nearest hotel (the Oriental), in a trunk supported on piles, which is carried out over the waters of the outer bight of Sheepshead Bay to a point about 200 ft. south of the channel, where the mean depth of the water is stated to be not less than 6 ft.

The outflow from this trunk being controlled by a gate with screen above, and the trunk being of ample capacity for holding the accumulation for several days if desired, of the average quantity of solid matter conveyed by the sewer, it is evidently possible to effect the object of the designer, namely, to detain such solid matter until the ebb of the tide has become strong, and then discharge it and flush the trunk.

4th. The outer bight of Sheepshead Bay, at the point of discharge of the sewer, is at least 1,300 ft. wide, with a maximum average depth of 5 ft., and the point of discharge mentioned is not more than 5,500 ft. distant from the inlet connecting the bay with the ocean.

5th. The construction of all these works, so far as seen, is thoroughly good and substantial.

In view of these facts we are of the opinion:

1st. That the work in question fully provides for all probable contingencies of requirement, and

2nd. That the proportion existing between the highest possible estimate of the quantity of sewage, and the lowest possible estimate of the quantity of tidal water into which it is discharged, taken in connection with the certainty of delivering the solid matters of the sewage at any stage of the tide desired, preclude the possibility of injury to the sanitary condition of the neighborhood from the operation of the works in question.

We remain, very respectfully,
JULIUS W. ADAMS,
GEO. H. FROST,
WM. N. SYMINGTON,
RICHARD SCHERMERHORN.

PERSONAL.

The Ohio State Board of Public Works elected three engineers, nine superintendents, and twenty-seven collectors. Akron officers were all reappointed.

Mr. J. C. Munroe, the Master Mechanic for the Mexican National Construction Company (Sullivan-Palmer), Mexico, arrived in this city on April 1, and is stopping at the St. Nicholas Hotel.

Mr. H. C. Lowrie, City Engineer of Denver, Col., has been appointed Chief Engineer of the Denver & New Orleans R. R. Mr. Lowrie will retain the position of City Engineer for the present.

Mr. Max E. Schmidt, late Chief Assistant Engineer of the South Pass jetties, has accepted the position of Locating Engineer on the Mexican Central Railroad. He left St. Louis for Tampico, Mexico, on the 2d.

Mr. Frank Adams has been appointed Road Master of the Dubuque Division of the Chicago, Milwaukee & St. Paul Railway Company. The construction and repairs of the tracks, bridges and buildings, are placed under his immediate control. All matters pertaining thereto must be referred to him, and all employés, in these departments, will report to and receive instructions from the Road Master. By order of J. H. Jenkins, Superintendent.

Mr. Sidney Gilchrist Thomas, who is now well known in this country as the principal discoverer of the "Basic Process" of steel making, arrived in New York from England on the 24th ult. The Association of Bessemer steel manufacturers have purchased from Mr. Thomas the right to use his process in America, and we presume that the gentleman has come over partly on this business, and very largely to see a country of which he has undoubtedly heard a good deal. Mr. Thomas is but 30 years of age and appears more like a scholar, than a man of business, but is still most thoroughly acquainted with the practical details of iron and steel making.

On Friday evening by the invitation of Messrs. Abram S. Hewitt, A. L. Holley and Lenox Smith, a party of about thirty-five gentlemen representing largely the Bessemer steel interests of the country, the civil and mining engineers, the metallurgists, and certain class journals, sat down to a dinner at Delmonico's, given in honor of Mr. Thomas. Mr. Hewitt presided; Delmonico catered with his usual good taste and magnificence; speeches were made by Messrs. Hewitt, Thomas, ex-Mayor Cooper, Carnegie, Profs. Thurston and Chandler, Bayles of *The Iron Age*, Holley, Bogart and Raymond. The evening was a most enjoyable and satisfactory one, and Mr. Thomas' introduction to his American friends and well-wishers cannot fail to be an agreeable reminiscence of his present journeyings.

Gen. Hermann Haupt, the newly appointed General Manager of the Eastern Division of the Northern Pacific Railroad, is a graduate of the West Point Military Academy. He resigned from the army to take the position of principal Assistant Engineer in the State service of Pennsylvania. He was afterward for several years Professor of Civil Engineering in the Pennsylvania University. After that he was principal Assistant Engineer of the Pennsylvania Railroad Company, under John Edgar Thomson. Subsequently he was appointed the General Superintendent of that great road, and organized its business departments. He also served as director of that company, having been elected by the Philadelphia City Councils. In 1856 he undertook the work of tunneling the Hoosac Mountain in Massachusetts. In the second year of the war, 1862, he was appointed Chief of Construction and Operation of the Military Railroads of the United States, and organized the army transportation. Subsequently he was Chief Engineer of the Shenandoah Valley Railroad. Afterward, and for three years, he was the General Manager of the line of railroads from Richmond, Va., to Atlanta, Ga. In addition to this immense experience in his profession, he has an established reputation as a successful bridge builder.

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.*

BY J. JAMES R. CROES, M. AM. SOC. C. E.

(*Continued from page* 133.)

In pursuance of a general plan for high-service supply adopted after a comprehensive examination and report by Mr. Davis in 1875, a temporary high-service supply for Brighton was provided in 1876, by a small reservoir on Academy Hill, 90 ft. square at top, and 9.67 ft. deep, founded on rock, with stone walls, lined with brick, coated with Portland cement and roofed over. The height of water is at all times shown on a dial in the engine house, which is a mile distant, by an electric indicator. When full, its surface is 174.10 above tide level. The supply is taken from the mains by two Washington pumps of 7-in. bore and 10-in. stroke. The reservoir is now used only when the draught is in excess of the pumping capacity, a check-valve with a safety-valve by-pass on the force-main, just outside of the reservoir, enabling the pumps to deliver directly into the mains when the pressure is kept above the reservoir head.

A high-service supply for about 850 buildings in East Boston was constructed on the same principle in 1880. Two Worthington compound engines, together of 1.5 million gallons capacity, were put on the main at the reservoir.

In the gate chamber of the Beacon Hill Reservoir, which is used only in an emergency, a standpipe has been placed on the main, with a float and registering gauge, by which a continuous record is kept of the head in the distribution service, and from comparison of this record with a series of observations made at the distributing reservoirs to find the rate of consumption at every hour of the day, such data have been obtained that it is known by simple inspection of the profile made by the recording gauge what the rate of consumption is in the city at any hour on any day.

Notes of rainfall, of evaporation from water sur-

* Copyright 1881.

faces, of the discharge of the supply streams, of pressures in mains and all the varying conditions of supply and consumption of water, are kept with great care in this department, and the results published generally in the annual reports.

MYSTIC WATER-WORKS.

In 1873 the city of Charlestown was annexed to Boston. This city is supplied by water from Mystic Lake, 66 miles from Charlestown, which has an area of about 200 acres, with a storage capacity of 380,000,000 gallons of water. Its water-shed is 27.75 square miles. The works were built in 1864, after the plans of C. L. Stevenson, C. E. A dam 1,560 ft. long is built across a narrow portion of the lake to 11 ft. above high water mark. Two rows of 6-in. sheet piling, 15 ft. long, were driven to an average depth of 11 ft. below the water line and extending along the main portion of the dam about 550 ft. Between these rows, 5 ft. apart, is a puddle wall 11 ft. high, and against the interior of the lower side a wall of concrete masonry 18 in. thick is laid.

A single row of 6-in. sheet piles extends a further distance of 330 ft., protected on the upper side with concrete and puddle walls. Earthwork forms the bulk of the dam, having a surface width of 15 ft., sloping with side slopes of 2 to 1.

From a little above water line on each slope and extending to the bottom there is a layer of puddle 2 ft. thick, with 1 foot of rip-rap on its surface.

The overfall is of cut granite masonry, and consists of five piers and two abutments with six waste ways of 6 ft. each. The distance between abutments is 80 ft., the piers being 5 ft. wide at the base and 11 ft. long in direction of the stream. The whole structure rests on piles driven into the quicksand 18 ft., with a covering of 18 in. of concrete, and an apron of cut granite. The lines of 6-in. sheet piling extend on both sides of the base of the overfall, and the concrete masonry covering the piling extends thereto.

According to the laws of the State a fish way has to be provided at all dams, to allow of the fish ascending the lakes and streams. It is constructed of heavy planking, forming a deep trough, inclined from the top of the top plank to nearly the surface of the lower water, where it turns with an abrupt right angle and discharges in that angle into the water below. It increases in width as it descends. In the interior of this trough, from each side, alternate transverse partitions extend some two-thirds of the width, terminated at each end with right-angled projections up stream. This arrangement breaks the force of the waterfall, forming in each division of the trough eddies and back water, enabling the fish to rest on their upward journey as often as they choose.

The gate-house is supported upon oak piles driven into the quicksand, upon which lies a bed of concrete surmounted by an 18-in. flooring of cut granite masonry.

The conduit from the lake to the pipe-chamber on the north bank of the Mystic River, a distance of 7,453 ft., is brick masonry, generally 8 in. thick; is oviform 5.67 ft. high and 5 ft. wide, the base being semi-circular, of 5 ft. diameter, the upper segment having a rise of 3 ft. 2 in. Its gradient is 1 in 10,000. Upon the lower section, near Mystic River, springs caused leaks in the conduit, and it was found preferable in three cases to give the springs free access to the conduit.

The earthwork of the conduit was began in 1862, and the whole finished in 1864.

From the pipe-chamber the water is conveyed to the pump well of the engine house by two 36-in. cast-iron mains passing under the Mystic River for 485½ ft. The bottom of the pipes is about 11 ft. below high tide.

For 150 ft. under the river the pipes were surrounded by concrete, 6 in. thick, but for the remaining distance they were bedded on 6-in. concrete, and the two pipes surrounded with puddle.

The engine room contains two Worthington pumps of a capacity of 5,000,000 gallons, and one of 8,000,000 gallons in 24 hours. The pump well is 30 ft. long, 11 ft. wide and 14 ft. deep. It is sunk down to and into the rock, which is covered with concrete, and upon this is laid a floor of hard-burned paving bricks on edge. A small sub well is sunk to a still greater depth to admit of completely drying the well. The sides are of rubble masonry, lined with brick 3 ft. thick at bottom and 2 ft. at top.

The reservoir at Walnut Hill serves both for receiving and distributing, and is capable of supplying any of the towns lying between the Charles and the northern slope of Mystic River. Its water surface is 4½ acres, with a length of about 560 ft. and a width of 350 ft. It is 26 ft. deep and its capacity is 26,244,415 gallons. The bank was built in layers 6 in. thick, wetted and rolled with grooved rollers. The inside slopes, 1½ to 1, are lined with puddle 2 ft. thick, which is covered with brick work 8 in. thick. The top water line is 147 ft. above tide level. The bottom is puddled and covered with concrete 3 in. thick, and the base of brickwork has also a foundation of concrete.

Charlestown was supplied until 1870 by one 24-in. cast-iron main from the reservoir to Charlestown Neck, 16,250 ft., with branches to Medford on the east and Somerville on the west.

In 1867 arrangements were made for the supply of Chelsea, a cast-iron pipe of 16 in. diameter, inclosed in a wooden casing, was carried across the Mystic River by way of Chelsea bridge. Where the two draws in the bridge occurred, inverted siphons of 24-in. pipe were laid, boxed and bolted and the spaces filled with concrete. The total length of this crossing amounted to 3,299 ft.

In 1868 a contract was made to supply the town of Somerville, and an 8-in. main was carried across the Mystic River to Malden. The crossing was made of Ward's flexible-jointed pipe for 805 feet. In 1876 a 16-in. pipe was carried across Malden bridge with an inverted siphon of 20 in. pipe.

In 1870 a 30-in. wrought-iron and cement supply main was laid, 15,305 ft. long, connecting with heavier distribution pipes in Charlestown. According to the original plan, the distribution pipes ranged between 16 and 4 in. in diameter, some 2-in. pipe, too, were laid. When Chelsea and Everett were added to the distribution, 20-in. pipes were laid in Charlestown. Wrought-iron and cement pipe was generally adopted, but in Charlestown it has proved comparatively of short life, and during 1876–7, 12,254 ft. were taken up and replaced with cast-iron pipe, only 500 ft. of it being fit for further use. 10,600 ft. more were taken up in the next two years.

All the distribution pipe of the Cochituate works are of cast-iron.

The use of meters received a good deal of attention at an early day. The Huse meter was used for several years, but in 1857 it was reported as unreliable and Worthington meters began to be used. In 1880 1,313 meters were in use in both divisions of the works.

The population, pipeage and consumption every tenth year have been as follows:

Year.	Population.	Miles of pipes.	Consumption mill. gals. per day.
1850.....	182,786	...	5.84
1860....*.....	247,496	129	17.24
1870.....	283,816	193	15.00
1880*.....	412,000	500	35.90

* Includes the Mystic supply.

The number of water takers is 68,334.

The Cochituate works were built under three commissioners. On their completion in 1850 a water board was elected for one year.

In 1851 the Cochituate Water Board was constituted, of seven members. A city engineer, chosen by the Common Council, was the chief engineer of the water-works. The city engineers have been E. S. Chesbrough, 1850 to 1855, James Slade, 1855 to 1863; N. Henry Crafts, 1863 to 1872; Joseph P. Davis, 1872 to 1880; Henry M. Wightman, the present incumbent. The Cochituate Water Board was abolished in 1876, and the Boston Water Board of three members constituted.

The cost of the works and their revenue to Dec. 31, 1880, has been as follows:

	Cost.	Revenue.
Cochituate works.	$16,735,055.79	$17,257,211.21
Mystic works.....	1,619,660.38	3,192,000.00
	$18,754,716.17	$20,449,211.51

VI.—ST. LOUIS.

St. Louis, Missouri, on the west bank of the Mississippi River, in latitude 38° 37′ 37.5″ N. and longitude 81° 8′ 33.3″ W., covers an area of about 60 square miles, and has 11.3 miles of river front.

The ground rises from the river quite rapidly, and the city is divided by the valley of Mill Creek into two hills, the northern rising to 140 ft. and the southern to 155 ft. above the river.

Founded in 1764 and incorporated as a city in 1822, it had attained in 1830 a population of 6,694, when the first water-works were built. The water was taken from the river at the foot of Bates street, and pumped by a high-pressure engine of 17-in. cylinder and 72-in. stroke, working a pump of 13½-in. bore and 72-in. stroke.

The water was taken from the river by cast-iron pipes with hub and spigot joints, which drew apart in 1848, and were replaced by pipe with flanged joints bolted. The water was lifted about 60 ft.

In 1846 a second engine was built, 20-in. cylinder, with pump of 16-in. bore, both having 96-in stroke and lifting 140 ft.

Both of these were removed in 1857. In 1852 an engine of 26-in. cylinder, with pump of 20-in. bore, enlarged in 1858 to 22 in., both having 120-in. stroke, was added, and in 1856 another engine of 26-in. cylinder, with pump of 20-in. bore, replaced in 1861 by one of 26-in. bore, both having 120-in. stroke, was added. In 1868, an engine of 30.5-in. cylinder, with pump of 28.5-in. bore and stroke of 120-in. was added. These three engines were abandoned on the completion of entirely new works in 1871, and were sold in 1875.

RESERVOIRS.

The first reservoir, built in 1830, was of brick and stone, about 60 ft. above the river, near the engine-house and on Broadway.

On its becoming filled with sediment in a few years, a wooden tank was built on top of it, which was used until 1849, when a reservoir was built about 6,000 ft. from the pumps on Howard street, 120 ft. above the river. It was 250 ft. square and 15 ft. deep, with masonry walls. The old reservoir tank was very dilapidated at that time, and does not seem to have been used much longer.

In 1853 the new reservoir was cleared of 4 ft. of sediment which had accumulated.

Its removal took eleven days, and cost $2,167. The insufficient size and rapid filling with mud of this reservoir induced the building, in 1855, of another adjoining it, 527 by 237 ft., and 47.5 ft. deep. The walls of rubble masonry, lined with brick on the water side, and strengthened by 44 buttresses, connected with the walls by elliptical arches of 16 ft. span and 4 ft. versed sine.

An earth embankment was placed against the walls, but this was not finished until 1861. In the meantime the brick walls cracked and leaked from time to time, the leaks generally stopping by deposition of sediment.

The great quantity of sediment in the Mississippi has been the most serious obstacle encountered in procuring a good water supply in St. Louis.

This sediment, amounting at times to 1.8 per cent. of the bulk of the water, cut the rope pack-

ing of the pump piston to such an extent that it had to be renewed every 12 or 18 hours.

A large portion of the sediment (944 parts in 1,000) is deposited within 24 hours in still water, at ordinary stages of the river, but for two months in the year during floods, there is so much fine sediment that no amount of settling will clarify the water.

While reservoirs for settling are a necessity to keep the mains free from deposit, the enormous deposits in the reservoirs have always been troublesome. The old reservoirs of 1830 became filled, the same thing occurred to the reservoir of 1849, the reservoir of 1855 had 12 ft. of sediment in it in 1858, in 1860 the mud was over the outlet pipe, and a stand pipe 17 ft. long was put in, in 1862 the depth of solid mud was 14.33 ft., and of soft slush 2.50 ft., in 1867 the deposit was 30 ft. deep, and the construction of a supplementary reservoir became necessary to tide over the interval until the new works, then in progress, were ready to go into operation.

After having been abandoned entirely for twelve years, it was cleaned out in October, 1880, by a method of hydraulic mining, designed by Henry Flad, C. E., the President of the Board of Public Improvements. A trough was built from the reservoir to some low lands it was desired to fill up, a mile and a half distant. A jet from a hose cut vertical drifts in the bank of mud. Two other jets under cut it, and then softened the falls which were made. A fourth jet flushed the the canal and carried the material down it.

NEW WORKS.

In 1865 James P. Kirkwood, C. E., was called upon to prepare designs for a system of works, and they were built after his plans in 1867–72.

The water taken from the river at Bissell's Point, at the northern city limit, through 66-in. iron pipe, terminating in a cast-iron tower sunk in the river to the bed rock, is received in a pump-well of masonry built on a coarse, unyielding sand, which is confined by sheet piling for 12 ft. below the well, or 25 ft. below the lowest water level in the river, the bank of the river near by being covered with rip rap.

The inlet tower is arranged to take water at any depth. Ordinarily it is taken at 5 ft. below the surface, where it is found to be freest from the impurities which float and from the sediment near the bottom. Two Cornish Bull pumping engines, with steam cylinders 56 in., and pump-plungers of 56-in. diameter and 144-in. stroke, and one rotative beam engine with cylinder 60 in. diameter and 84 in. stroke, and a plunger pump of 50 in. diameter at each end of the beam, lift the water from 15 to 50 ft., according to the stage of the river, into the settling reservoirs, which are 365 ft. from the engine-house, in four divisions, each 600 by 278 ft. and 19 ft. deep. The sides are lined with squared stone range masonry, 4 ft. thick at the top and 9 ft. at the bottom, reinforced every 7 ft. by 3 by 4 ft. buttresses, the whole resting on foundations of timber and concrete distributed so that the load shall not exceed 200 lbs. per sq. ft., and placed on the loose alluvium of the river "bottom." The walls are backed with puddling. The partition walls of the basins are 8 ft. wide at the top and 11 ft. at the bottom.

The floors are paved with brick on edge, and slope toward the centre and the river side. The basins are used alternately, one being drawn from, one filling and two settling, or one settling and one being cleaned. The sediment is removed from each basin about once in four months, about 16 in. having collected in that time. In 1878 184,000 cu. yds. of sediment were removed from the basins at a cost of 1.05 cents per cu. yd., and in 1879 140,160 cu. yds. were removed at a cost of 0.84 cent per cu. yd.

From the settling reservoirs a brick conduit carries the clear water 1,100 ft. to the clear water well, 150 by 100 ft. and 17 ft. deep, from which a brick conduit, 13 by 8 ft., leads to a screen chamber, 50 by 9 ft., whence three 60-in. pipes lead to the pumps in the dry well, 12 by 87 ft., and 39 ft. below the high-service engine-house floor. The first two high-service engines, erected in 1871, are double-acting fly-wheel engines, with steam cylinders of 85-in. diameter and pumps of 50½-in. bore, both having 120-in. stroke. The third and fourth engines, erected in 1875, are a pair of compound beam engines, coupled to one crank shaft with the fly wheel between them. The high pressure cylinders are 50-in. diameter and 87-in. stroke; the low pressure cylinders are 80-in. diameter and 138¼-in. stroke. The pumps have 45¼-in. buckets and 32-in. plungers and 100-in. stroke.

After the construction of this compound engine the two pumps first erected were remodeled, their original construction having been defective, and frequent repairs having been required.

These engines lift the clear water 170 ft. into a storage reservoir on Compton Hill, which has a water surface of 870 by 540 ft., and is 22 ft. deep.

The embankments are puddled in the centre and faced with 16 in. of dry stone wall on 8 in. of broken stone. The bottom is covered with 6 in. of concrete on 2 ft. of puddle. The full water level of this reservoir is 176 ft. above the city directrix or base of levels, which is a plane ft. below the highest and ft. above the lowest water recorded, of the Mississippi.

About half way between the pumps and the reservoir a stand-pipe is erected on the force main.

For distribution, cast-iron pipes have always been used. In 1851 a number of pipes were taken up badly corroded and broken. Before the construction of the new works the distribution was badly arranged, and the number of small pipes laid was great. In 1862, out of 66½ miles of pipe in use, 15 miles were of less than 6-in. diameter. Since 1868 no pipes have ben laid of less than 6 in.

The use of meters was begun in 1864. In 1875 a series of experiments was made on the durability of a great variety of types of meters by Colonel Flad. In 1869 there were 182 meters in use; in 1880 the number is not reported.

The population pipeage and consumption every tenth year have been as follows, as far as can be obtained from the reports:

Year.	Population.	Miles of Pipe.	Daily Consumption in Millions of Gallons.
1830	6,696	....	....
1840	16,649	....	No record.
1850	74,439	....	2.
1860	160,773	65.	5.5
1870	315,463	101.6	11.
1880	350,522	190.6	25.

From 1830 to 1867 the works were managed by a superintendent who reported sometimes to the City Engineer and sometimes to the Common Council. A special commission was appointed in 1865 to examine the question of additional supply, and in 1867 the control of the old and new works was placed in the hands of a board of water commissioners.

In 1878 a board of public improvements was constituted, consisting of a president and five commissioners, respectively of streets, water-works, sewers, parks and harbor.

Willis R. Pritchard was Superintendent of Water-works for several years prior to 1871, when the new works were completed.

Thomas J. Whitman, C. E., has been Chief Engineer since 1867, and is now Water Commissioner and Chief Engineer.

Col. Henry Flad, C. E., was principal assistant to Mr. Kirkwood in preparation of the plans for new works, one of the Water Commissioners afterward, and is now President of the Board of Public Improvements.

The cost of the old works from 1830 to May, 1867, at which time they passed into the hands of commissioners, had been $2,421,070.32 and the receipts $2,096,278. On the completion of the new works in 1871 the old works and their operation had cost $2,980,000, and the income from them had been $3,780,000. To May, 1876, the total cost of all works had been $11,894,258.49, and the receipts $5,545,768.20. The net cost of meintenance of the works in the year 1879–80 was $196,817.99. The income from water rents is placed in the hands of another department of the city government, of which no return now appears in the Water Commissioner's reports.

TO BE CONTINUED.

We are pleased to acknowledge the receipt from Arthur G. Moore, Supt. Cincinnati Water-works, of reports of those works for years 1863 to 1879, and advance plates from report for 1880. From I. J. Bell, Asst. Supt. Cincinnati Water-works, abstract of history of these works from 1817 to 1854, and of annual report for 1880. From C. E. Fowler, Supt. Poughkeepsie Water-works, reports of those works for the years 1877, '78, '79 and '80. From Lieut. F. V. Greene, U. S. A., Washington Aqueduct Reports for 1876, 1877, 1880. The Municipal Register of the city of Springfield, Mass., for 1881, and the Seventh Annual Report of the Board of Water Commissioners to the City Council, from Geo. A. Ellis, City Engineer. From H. Starkey, Secretary Board of Water Commissioners of Detroit, Act of Incorporation of Water Commissioners of Detroit; Reports of Detroit Water Commissioners for 1870, '72, '73, '74. From R. K. Martin, Chief Engineer Baltimore Water Supply, Reports of Baltimore Water Department for years 1867, '70, '71, '72, '77, 79, 80.

SURVEYING, LAYING OUT AND MONUMENTING THE NEW WARDS OF NEW YORK.

BY S. S. HAIGHT, CIVIL ENGINEER AND CITY SURVEYOR, WEST FARMS, NEW YORK.*

VI.

The office for this work was moved to the old Convent of Mount St. Vincent, in Central Park (that was recently burned), at about the time of the completion of the topographical surveys, but is now, and for some years has been, at the former arsenal, in the southeast corner of the park.

The plan generally adopted for parks in the new district is well described in a "Report of Hon. Wm. R. Martin, President, upon the subject of laying out the Twenty-third and Twenty-fourth Wards," dated Dec. 20, 1876.

"The features of this plan are, that instead of massing the area devoted to park purposes in one or two places, there will be a distribution of the area in a greater number of places, connected by park-ways of sufficient width for the adjacent country to be planted out, so as to preserve the appearance of a park to the persons who walk or drive along them. This plan can be well illustrated, if we suppose that instead of taking the Central Park in one mass, the same number of acres had been taken in several parks along the banks of the East and North Rivers, and on the commanding and picturesque portions of the Central Park, and then had been connected by broad park-ways. The quantity of land taken, and the cost, would have been no larger, but the drives would have had five times their present length, and the variety of character and prospect would have been much greater. They could have been designed to include all the points of beauty for which this island is matchless. The effect on the value of property would not have been limited to a border avenue, but would have extended over the whole region. In the plan which will be presented, parcels of land will be suggested,

* CORRECTION.—In second line from top of third column, on page 123, the word "understood" should have been "*recognize*," so as to read, "did not recognise my position."

where the natural beauty of the land or its advantages of situation indicate its appropriateness. These parks will vary in extent. They will be connected by park-ways from 200 to 400 feet in width, so as to present the advantages of a large park with every variety of surface, and brought into contact with every portion of the whole region. The economy of such a plan rests upon the following points: The advantages which they give to the population will be distributed through the whole territory. The quantity of land taken will not be above the proper per centage that should be preserved in a city and suburban region of so great natural beauty. The quantity of land taken for streets and parks on the new plan will not be greater than the quantity taken for streets alone on the old plan. The effect will be to make the region attractive to population, and to encourage settlement." The ideas of Mr. Martin appeared to be based upon sound reasoning, and have been developed in the adopted plans.

A chain of parks and park-ways, passing through the roughest and most wildly beautiful portions of the territory and over those where the grandest views can be obtained, connects Spuyten Duyvil on the Hudson River with Port Morris on the Long Island Sound.

There will be utilized for the links of this chain the courses of some streams that flow through wild, rocky ravines, where the land is well wooded and the natural beauties for park purposes are of the highest order; and where the sanitary requirements imperatively demand their use by the public for drainage purposes, while the land possesses little value for other uses.

Lands will also be taken therefor, inclosing and bordering upon some ponds and large streams, whose waters can be kept uncontaminated by sewage only in that way.

From the most elevated part of this park-way, east of the Croton Aqueduct, can be enjoyed the most extensive and beautiful inland views that are to be found within the city limits.

A little north of the village of West Farms this park-way will follow the route of the old Boston post-road, with broad parks upon either side; that upon the east, now known as Lydig's grove, extending from the road to the shore of the Bronx River, which here forms a broad and beautiful pond. This grove has for many years been a favorite resort for pic-nics.

Passing west of the village, the avenue (here named Edgewater Road) again borders the Bronx River from a point a little south of the head of tide-water, to its connection with the Long Island Sound east of Hunt's Point; from there to Port Morris the drive will follow the shores of the sound with a width of two hundred feet, and for beauty of prospect will be unsurpassed.

This drive will furnish all the advantages of a park, continuously for many miles, and is so arranged that any change that would make narrow streets for portions of its length would be a serious detriment to the whole. For this reason, if for no others, the bill now before the Legislature, proposing to change the plan of the Spuyten Duyvil park-way, should be opposed by residents of every part of the annexed territory.

If the Legislature should so change the number of Commissioners of the Department as to make impossible a *tie* vote upon any subject, it would serve the interests of the people far more than by any interference with the plans that have been adopted after receiving so much care and study. It would also deserve praise if it should deprive the aldermen of the power they now have to abridge the width of streets by permitting private constructions therein; and it would be gratefully regarded if it should require all horse railroad companies using streets to keep them in proper condition for other vehicles than cars.

The work described in the foregoing pages is entirely distinct from that of the repair of old streets, the engineering force having nothing to do therewith, though both works are under the same Commissioners. The work of construction is also kept separate, though that is being temporarily performed under the care of the Topographical Engineers, as before stated.

A member of a committee of the State Senate investigating the city expenditures within the past year, is reported to have expressed the opinion that the Park Department has no need for engineers now that the construction of Central Park is finished.

Those who consider the necessity of skill and care in the monumenting and mapping of city streets, that there shall be no after trouble by reason of errors, will decide differently from this Senator, when told that this work remains to be performed for more than six thousand acres of the new wards, and that (excepting for railroads and water supply), all public works of construction northeast of the Harlem River, including the crossings of the Harlem and Bronx, are placed by law under charge of the Department of Public Parks.

CORRESPONDENCE.

STREET RAILWAY GRADES.

Lawrence, Mass., April 4. 1881.

Editor Engineering News:

Will you please favor me by granting a place in your columns to the following, to which, will some of the readers of Engineering News please reply?

In laying out a street railroad for freight purposes, low heavy grades and sharp curves, would it be practicable to employ—the gauge to be 4′ 8½″—motive power, a dummy engine; rate of speed limited by city ordinance to four miles per hour?

Would like some localities cited where unusual grades and curves have been employed, and whether or not any difficulty has been experienced in their practical use.

Yours, A. D. Marble,
City Engineer.

PROBLEM IN RAILROAD CURVES.

Boston, April 4, 1881.

Editor Engineering News:

I was much interested in the solution of Mr. L. E. Vel's problem by Mr. Searles and Prof. Philbrick, but it seems to me the following would suggest itself to most engineers in practice:

Tan. 20° × radius 2° curve = tan. 2° curve = x.
Tan. 1° × radius 1° curve = tan. 1° curve = y.

$$\left[\frac{\text{sin. } 20° \times \log.\ (x+y)}{\text{sin. } 60}\right] + x = AC, \text{ required distance.}$$

tan.	20° = 9.561066	tan.	10° = 9.246319
log.	2864.93 = 3.457114	log.	5729.65 = 3.758128
x	= 1042.75 = 3.018180	y	= 1010.30 = 3.004447
y	= 1010.30		
log.	2053.05 = 3.312399	log.	2053.05 = 3.312399
sin. a. c.	60° = 0.062469	a. c. sin.	60° = 0.062462
sin.	20° = 9.534052	sin.	40° = 9.808067
	810.81 = 2.908920		1523.82 = 3.182935
x	1042.75	y	1010.30
	1853.56 AC required dis.		2534.12 CB.

This solution also gives all the distances required in laying out the curve. The others do not.

C. W. L.

PROBLEM FOR ENGINEERING STUDENTS.

New York, April 5, 1881.

Editor Engineering News:

I offer the following as answers to the problem on page 136:

(1) and (2). Yes, $147.40. (3) and (4). The company owes the agent his salary for three months. (5). Gained. (6). $22.40, allowing nothing for interest on stock in trade.

It strikes me that the diagram and text relating to it in Professor Philbrick's article are at loggerheads. *APB* being given, *AP* cannot be *prolonged* to the intermediate point *K*. *DKH* would not have been called a "tangent" when I was at school. "Natural Methods" appears to be ahead.

Yours, John C. Chase.

SECOND SOLUTION.

Water Commissioner's Office,
Troy, N. Y., April 5, 1881.

Editor Engineering News:

Below are answers to "K. M. Puter's" problem in your paper of Saturday, April 2:

To question 1. Yes. 2. $147.40. 3. Yes. 4. $125. 5. Gained. 6. $161.80.

Respectfully, O.

LANDMARKS.

Lowell, Mass., March 30, 1881.

Editor Engineering News:

In reading the article on "Landmarks," in Engineering News for March 26, I am reminded of the method adopted while I was with William H. Dennis, assistant in the U. S. Coast Survey, of marking triangulation stations while engaged in the survey of Barataria Bay, Louisiana.

The stations on the seacoast were mostly in sand, and were marked with the iron screw-pile used by the Coast Survey Department. They consisted of a shaft, about four feet in length and four inches in diameter. At the base is a gimlet screw, at which place the diameter is increased considerably. An iron plate is attached to the top with letters cast upon it by which the station is identified as a Coast Survey Station. These piles are screwed into the sand by lashing hand-spikes to the top and turning the piles by means of these hand-spikes.

When we came to the country back from the seashore the mud was so soft that an iron pile would probably sink. The following method was therefore adopted and gave good satisfaction:

After digging a hole of suitable depth, a length of vitrified stone pipe about three feet in length and four inches in diameter, was placed with the bell end down and resting on a piece of board placed in the bottom of the hole to spread the base. The earth was then placed around the pipe, and the interior filled with a mortar made of Rosendale cement. Before the mortar sets a copper wire eight or ten inches in length is inserted at the exact station, after which more mortar is placed over the top of the pipe, and also around the pipe for a space of one or two feet, making a mound of mortar about three feet in diameter, and a few inches high at the centre. A copper nail is then placed over the wire.

By spreading mortar around the bounds, the marsh grass, which grows very rank in that locality, is prevented from growing over the bound.

Witness marks were also use for marking the station when it was possible.

I think this method possesses decided advantages for cheapness, permanencey, and convenience. Yours, etc.,

Melvin B. Smith.

FIELD-BOOKS AND LOGARITHMS.

Editor Engineering News:

Referring to Prof. Philbrick's second article on "Field-Books and Logarithms," I find two points at issue; one upon the solution of a problem, the other upon the merits of logarithms in general.

First. It is fair to assume that when "L. E. Vel" propounded the problem as it appeared in the News of March 5, he desired a general solution which would be of service to him in his future practice. It was evidently so understood by others whose answers you have published, and was so treated by myself. Prof. P., however, in order to show a shorter method, resorts to what may be termed special pleading, and avails himself of the fact that in "Vel's" supposed case one radius

happens to be double the other, while the total angle happens to be 60°, so that its sine equals the cosine of its half. Thus, although the professor arrives at a very pretty solution of this particular case, his formula is worthless for any other set of values. It is not a general formula, and therefore has no right to be compared with mine.

Again, it usually happens in practice that when one side is required the other is required also; hence I gave the solution for both sides and also the angles at A and B. He has found but one side, and no angles, and yet presumes to compare the length of his process with mine.

If, however, but *one* side were really required, I beg to refer for the proper general formula to eq. 110 of the book before quoted, where we find

$$S_1 = \frac{(R_2 - R_1)\ vers.\ \Delta_2 + R_1\ vers.\ \Delta}{sin.\ \Delta}$$

or its equivalent,

$$S_1 = (R_2 - R_1)\frac{vers.\ \Delta_2}{sin.\ \Delta} + R_1 \tan \tfrac{1}{2}\Delta$$

For our special case we have $\Delta = 60°$ and (approximately), $R_2 = 2R_1$, whence the above reduces to

$$S_1 = R_1 \frac{\frac{1}{2} + vers.\ \Delta_2}{sin.\ 60°} = R_1 \frac{1\frac{1}{2} - cos.\ \Delta_2}{cos.\ 30°}$$

which is Prof. P.'s formula.

Now, as to the solution, I think you will spare me four lines for the purpose.

R_1 (2°)	*log.*	3.4571
$1\frac{1}{2} - cos.\ 20°$ .59031	"	9.7484
sin. 60°	*a. c.* "	0.0625
$\therefore S_1 =$ 1853.5 = AC		3.2680

I use only four places, because of the assumption above $R_2 = 2R_1$, giving the value of R_1 correct only to the nearest foot. These are *all* the figures, just 30. There are no multiplications, divisions nor interpolations, and only one addition.

The process indicated by Prof. P. (using only *four* places, however), requires 69 figures, nine multiplications, one addition and five subtractions to reach the same result. If five places were used, the total number of his figures would amount to 86, with a corresponding increase of labor.

Since he declines meeting me fairly on my own ground, I meet him thus on his, and think that in this instance, at least, it will be seen I have not been able to "learn any short or simple method" of my respected correspondent.

Second. As regards the merits of logarithms, I concede the professor's right to expound his own article. I accept his several disavowals, and regret that I should have so misunderstood what he intended to say. But there is a question of fact regarding the use of logarithms, which it is to the interest of every young engineer to have settled. The professor challenges "any one to show that within the whole range of mathematics they (logarithms) have any uses not admitted in my (his) article." Now, what uses has he admitted? I quote from his article: "The use of logarithms in field computation is time-consuming, conducive to error, and they serve as a delusion and a snare. In a possible case or two they may be used as a means to a desired end. These cases are, however, barely possible in practice, and never occur in field operations." That is all he says about their uses.

What, then, are we to understand about multiplication, division, finding of powers and extraction of roots? Do these processes "never occur in field operations," or is this "one case in which he has made the slightest mistake?"

I am at a loss to understand what are the real objections in the Professor's mind to the employment of logarithms. He remarks: "We seem frequently to forget that logarithmic tables often involve errors greater than those contained in many approximate formulæ." What kind of errors? If typographical, then all the tables are liable to the same criticism; if the inevitable lack of precision in the last decimal place is referred to, we have the same thing in tables of natural functions, and in all others based upon them; if errors in the *selection* of logarithms are meant, these are the fault of the man, not of the table; it is a personal error, not a mathematical one.

The only other objection to logarithms that I find suggested is the *labor* of "taking out" logarithms and finding corresponding numbers. If this objection be well-founded, it must be for the reason that this labor of interpolation is greater than that of the multiplications and divisions which the use of logarithms avoids.

How untenable is this ground is shown by the universal employment of logarithms in astronomic, geodetic and life insurance calculations, as well as in all others where it is necessary to interpolate carefully to the last fraction. If logarithms are economical for such purposes, how much more so when the interpolations need be but approximate, or sometimes ignored altogether without seriously impairing the result, as is very often the case in field calculations.

But the interpolations are by no means formidable. Take the case in hand. In the solution published March 19 (p. 116), of the five logarithms taken out, two are copied directly from the table, and the other three are obtained by mentally adding to the logarithm of the first four figures the correction given in the table of proportional parts on the same page. So in finding the three required numbers from their logarithms, the figures after the first four are found by a simple inspection of the lower table, accompanied by a mental effort, of which the average school boy is perfectly capable. There are no multiplications nor divisions whatever. Thus all the figures that needed to be written were published in that solution, and the charge of unfairness made against me in that respect is not well founded. My solution of to-day shows how useful logarithms may be without any interpolation.

It is because I am in favor of short and simple methods that I adopt logarithmic solutions as a rule, and I have so long experienced the great advantage to be derived from them that I should be sorry to see others diverted from using them through any false estimate of their value and convenience.

I desire to remark, by the way, that Prof. P. errs in saying that my solution (for the sides) requires the finding of an auxiliary angle. It is only the *cotangent* that is required. The remarks about "seconds," therefore, are not pertinent to the case unless the angles at A and B are required.

WM. H. SEARLES.

HOWE TRUSS SPLICE.

RICHMOND, IND., March 26, 1881.

EDITOR ENGINEERING NEWS:

In reply to Mr. E. S. Shaw, in your issue of 19th inst., I will say, that when I responded to "C. E. W. D's." communication relative to the principles involved in the proper design of a splice in the lower chord of a wooden truss, I intended to illustrate the importance of the principle that the three resistances of the wood should be equalized; that is to say, that the shearing, the tension, and the crushing strength all be as equally developed as possible, and did not offer the splice there shown as one to be followed out in practical detail. In the figure accompanying my communication, I purposely made the hooks and blocks shorter than I have ever used in actual practice, simply to illustrate the argument of my communication.

My statement that the splice therein shown "has borne the tests of experiment and practical work, and will stand the analysis of science," should have read "the *principles* illustrated in the plan have borne the tests of experiment and practical work and will stand the analysis of science." I will say just here that I do not use, or recommend the use of, *wooden* clamps while *iron* ones are cheaper and better.

With a view of gaining light on this subject I some years ago designed and caused to be made in wood six models of bridge chords; two of these were designed for upper chords the remaining four were provided with tension splices. One of the specimens was designed on a plan approximating very closely the splice so common in work of this class, and well illustrated in "C. E. W. D's" communication. One of the four was designed on the principles I attempted to set forth in the communication written in response to "C. E. W. D's" inquiries, the others were of still different design. The workmanship in each appeared good. The wood employed was pine and oak, all from a single stick of each kind. Of the four designed for lower chords, when tested to rupture, one splice broke under a strain equal to only 46 per cent. of the strain required to break the same specimen where no splice occurred; one broke with a strain equal to 52 per cent. of that required to break the solid stick; one broke with a strain equal to 65 per cent. of that required to break the stick unspliced, and one broke under a strain equal to 78 per cent of the strain required to break the stick unspliced. It is only necessary for me to state that other experiments since confirmed the results obtained in the first series. The plan I submitted, and which has elicited from Mr. Shaw such a positive expression as to its merits or rather *want* of merit, is in its proportion and general design very similar to the specimen that developed most strength in the above mentioned tests.

When theory and experiment agree so well, it is simply absurd to advise that work be executed from designs dictated by *practice* alone, as it is easy to show that practice may be far from right. Practical considerations sometimes outweigh all others, but it is in extremely rare cases where *science*, as a combination of theory and experiment, has failed to benefit practical effort or the works of purely practical men.

I have never designed or built a bridge with the splices in the lower chords of the exact proportions shown in the illustration accompanying my response to "C. E. W. D.," but I can assure Mr. Shaw that *the direct tension, shear and crushing strains would not deter me from using such splice, for they are fully provided for.* If I were designing this splice for actual service, I would probably make the hooks and blocks longer, through considerations entirely foreign to anything herein discussed, *i. e.*, the imperfections in workmanship and consequent unequal distribution of strains.

The chief merits of the plan submitted is in the equalizing of the *tensional, shearing and crushing strains.* Another important element of strength is in *dividing the intensity of the crushing strains*, and thereby reducing the liability of *splitting* off the projection by any lateral movement or *wedging* action of the fibers of the wood at the end of the projection where the strain is applied, or by any bending or lateral strains on the chord pieces.

Mr. Shaw says: "It is a very common thing in this part of the country to find the hooks of oak clamps a foot long sheared off, and it seems to me that one hook a foot long ought to hold as much as four hooks, each 2½ inches."

Now, experience in *any* part of the country might verify the first part of the above sentence, *i. e.*, that oak clamp hooks, a foot long, are frequently found sheared off—but this proves nothing, only that the hook in each of these cases was *overloaded;* in other words, the clamps were not designed in such a way that they could successfully resist the strains brought upon them and, of course, following a natural law, *broke by crushing and splitting off.* They probably did not shear off parallel to the grain *without* a splitting or wedge action at the ends, caused directly by the *intensity* of strain on the end of the projection. In any event, the immediate cause of their destruction is, of course, found in the fact that they were *overloaded;* then, to meet such cases, design a structure for the loads it is to bear with a proper factor for contingencies—*paying due attention to the elastic limit of the material*—and there will be found a *less* number of "hooks a foot long sheared off."

When Mr. Shaw fully recognizes the importance of distributing equally the shearing strains throughout the plane of stress in the body of the material, to be sheared by means of and through the assistance of large bearing or crushing surfaces, *then, and not until then*, can he see how 10 inches of shearing plane disposed in 2½-inch planes will bear more than ten inches disposed in one single plane. Mr. Shaw says that he "should expect the packing blocks to twist out of position very easily." As the *same* principles apply to the blocks that apply to the hooks, a proper application of those

principles can never result in a realization of Mr. Shaw's "expectations," but, on the contrary, will produce good and reliable results, with the further satisfaction (what to most engineers is important) of knowing that *the work is not, when completed, the product of a fudging or rule of thumb process.*

It is wonderfully easy to be critical, and to propound interrogatories and to use "inclinations to believe to the contrary" and "expectations" as a basis for such criticism.

Now, if Mr. Shaw is really searching for information and believes, as he says he is inclined to, and if he so doubts (as he evidently does) the accuracy of the results of a theoretic and experimental inquiry, would it not have been more in the true spirit of investigation to have, before publicly expressing such doubts, instituted a series of experiments that may have verified or controverted the truth of the principles enunciated in my communication? If he was unable to controvert with figures the theory there presented, surely the broadsword of experiment was at hand. Let him, before proceeding to criticise, obtain a basis for criticism. Let him carefully experiment—if he can not figure—and I predict that he will then drop his "inclination to believe" and his "expectations," notwithstanding his thirty years experience with "oak clamp hooks a foot long that sheared off." It seems to me that thirty years experience, even without the aid of mathematical research or experiment ought to have produced a better clamp hook than that. At all events *that* hook is no criterion by which to judge of the principles of design embodied in the plan I have submitted.

Very respectfully,
FRANK C. DORAN, Civil Engineer.

ENGINEERS' SOCIETIES.

ENGINEERS' CLUB OF PHILADELPHIA.

RECORD OF MEETING, APRIL 2, 1881.

Vice-President Henry G. Morris occupied the chair, thirty-four members and two visitors were present. Dr. H. M. Chance described an attempt to extinguish the Kehley Run Colliery fire at Shenandoah City, by carbonic acid gas and nitrogen. The gas was generated in an open brick furnace with reversed draught, and forced into the mine through four 3-in. pipes, by injectors supplied with steam at 60 lbs. pressure. Each pipe was supposed to supply 1,500 cu. ft. per minute, or a total of 6,000 cu. ft. per minute. The attempt was entirely unsuccessful, and Dr. Chance attributes its failure principally to *the impossibility of making the mine air-tight*, but also considers that the gas was delivered at too high a temperature, and that it was possibly mixed with carbonic oxide. The method seems to be worthy of further trials at mines that can be made thoroughly air-tight.

Mr. P. H. Baermann described briefly the construction of the Cooperstown, N. Y., Water-works, and particularly the method of laying the supply pipe extending from the pump house up the Susquehanna River into Otsego Lake, a distance of 4,500 ft. The pipe was laid from a staging carried on 120 barrels, and lowered in 108 ft. sections. Up to 9 ft. in depth the joints were made with dry pine wedges, and above this with lead. The end of the pipe is provided with a copper strainer, which is in 38 ft. of water and 10 ft. above the bottom.

A paper was also read by Dr. Chance on Wear in Wire Ropes, showing that the cause of rapid wear is often due to the use of drums, sheaves and pulleys of insufficient size, and that a great saving might be effected by increasing their diameters; especially that of the small deflection and knuckle pulleys and sheaves. The actual wear averages 0.138 cents in slopes, and 0.053 cents in shafts, per ton, for each hundred feet of lift.

HOWARD MURPHY, Corresponding Secretary.

THE INDIANA COUNTY SURVEYORS.

As a result of the call issued by H. B. Fatout some weeks since, the surveyors of twenty-five counties of Indiana met on the 3d inst., at Indianapolis, in State Convention, and effected a permanent organization by electing W. A. Osmer, of Cass County, President; L. S. Alter, of Jasper, Vice-President; H. B. Fatout, Corresponding Secretary; J. C. Pulse, of Decatur, Recording Secretary, and Isaac Piatt, of Marion, Treasurer. It was ordered that the organization should hereafter be known as the State Association of County Surveyors and Civil Engineers, and a committee was directed to prepare constitution and by-laws. A committee, headed by A. H. Polk, of Gibson County, was directed to consult with the Attorney-General on the duties of county surveyors, and a committee on business was made to consist of Messrs. Pulse, of Decatur; Murray, of Grant; Leach, of Johnson; Fatout, of Marion, and Parker, of Greene. The afternoon was principally devoted to informal discussion of matters pertaining to their professional duties in the field. W. A. Osmer, of Cass, was appointed chairman of a committee on legislation, it being the sentiment of the association that the Legislature should do something for relief of surveyors, but in what way was yet to be agreed upon.

ENGINEERING IN FOREIGN LANDS.

(Translated and prepared for ENGINEERING NEWS).

SOME NOTES ON DYNAMITE.

Dynamite was lately tried in the Bois de Boulogne as an agent for felling trees, and extracting large roots and trunks. The experiments were not satisfactory, unless the wood is considered of secondary importance. For the purpose of clearing ground of trunks and stumps it is, however, to be recommended, as the roots are broken up into small pieces fit for firewood.

Professor Tetmayer has a copious report in *Die Eisenbahn*, on the results achieved by dynamite and explosive gelatine in the St. Gothard Tunnel. A great deal of the effect of nitro-glycerine depends on the explosive cap. The Swiss dynamite factory, at Isleten, has been lately furnishing fuse cartridges filled with a fatty preparation, said to consist of 56 per cent. of nitro-glycerine; 34 per cent of salt of potash, 6 per cent coal, and 4 per cent of gun-cotton.

REMOVAL OF THE ICE-GORGES ON THE SAONE.

The hard winter of 1879–80 caused an extensive ice-gorge on the Saône, near Lyons—upwards of fifty boats were caught. It was determined to make a channel fifty meters in width and a kilometer in length, so as to isolate the boats from the ice and bring them down before the thaw. The mass of ice, which threatened Lyons, was estimated as between three and five million cubic meters. Dynamite was used in charges of 2, 3 and 5 kilos. The obstacles which caused the formation of the *mer de glace* were first attacked—these are always in the lower part of the glacier, toward the end of the mass.

MEXICAN NEWS.

In a communication to the New York *World*, dated the 5th, Mr. James Sullivan, of the Palmer-Sullivan Railroad Company, gives the following items in regard to his road:

"Having arrived from Mexico within the last few days, I can say that the greatest harmony exists between not only the State of Mexico, but all the other States as well, through which the railroad will pass, and the Palmer-Sullivan Company. There are now working on the section between Mexico and Toluca, 10,200 men, also on the section from Toluca to Maravatio, 3,000 men. Furthermore, between Morelia, the capital of the State of Michoacan, and Maravatio, there are 3,200 men. These men receive 3 reals (37½ cents) per day. Sleepers are contracted for 500 miles of line. Sixty-five thousand tons of steel rails (1,000 miles and side-tracks) have been contracted for, of which several thousand tons have already been delivered in the City of Mexico. Twenty-five parties of engineers are working for this company between the capital and the Texas border at Laredo, between Manzanilla and the capital, and at Zacatecas, and other points, and the plan of the Manzanillo and Colima section having recently been approved by the government the work of construction has been commenced at that end also. At the northern end the company's track will reach Laredo from Corpus Christi (165 miles) in June, and all arrangements are made with a view to executing the order to reach Monterey by the close of the present year and San Louis Potosi by the close of next year. There it will meet the track being laid northward from the capital, which is intended to reach San Louis Potosi at the same time. Further, two hundred locomotives have been ordered, of which four had arrived at the City of Mexico and were set up when I left there. Four thousand freight cars have also been ordered for delivery at Vera Cruz, Corpus Christi and Manzanillo. You will see, therefore, that the work is proceeding with great activity at many different points. I will only add, in conclusion, that good will exists between all the authorities, State and Federal, and the company, a fact which can be readily ascertained from any person recently coming from the City of Mexico."

A dispatch from Vera Cruz, dated April 5, states that the cable steamer Dacia has completed the first section of the Central & South American cable southward. The cable surveying steamer Hornet is at Acapulco, having taken very satisfactory soundings for the cable from Callao to Tehuantepec. The Central & South American Telegraph Company has secured all the necessary rights, and will connect with the West Coast Telegraph Company at Callao, establishing cable communication with Valparaiso, Chili.

The Mexican Gulf Steamship Company has established a telephonic line between San Andres Tuxtla and San Tecomapam.

Civil Engineers in Mexico receive about the same compensation as those occupying similar positions do in the United States.

FALL RIVER BRIDGE.*

BY THE LATE E. N. WINSLOW.

The superstructure of said bridge is of wrought-iron throughout, except bases of end posts and flooring, and is the Whipple plan of trusses, with double intersections, pin-connections, a deck and through bridge, with the railroad track on top.

The substructure is pneumatic piles of hard, light-gray cast-iron, with the carbon well combined with the metal, of about 16,000 lbs. per square inch tensile strength.

A charter was granted May, 1852, for a bridge across Taunton Great River, at Slade's Ferry. Various plans were suggested and considered, but none appeared very practicable or feasible, owing to the great depth of water (about 60 feet) and other obstacles, until I proposed that of pneumatic piles. Several cases of such piles existed, viz., the Harlem River Bridge, in New York City, and the bridge across the Missouri River at Omaha. Although the conditions in either of above cases were quite different from ours, still it was quite reasonable to conclude that no very serious obstacles could be encountered.

To inspire confidence in my directors, I went to Albany, and spent several days with Mr. Wm. J. McAlpine, who had built the bridge at Harlem River, U. S. Dry Dock at Brooklyn, and stood at the very head of his profession in this country. After discussing various plans, he heartily approved my notions, and gave me the greatest encouragement, which I somewhat needed at the time, being in very feeble health.

I was now permitted to proceed with the work, and having ordered a few cylinders at the Builders' Iron Foundry, Providence, R. I., proceeded to make up a plant for hauling the cylinders and sinking the columns.

For this purpose two large scows were purchased, each measuring on deck about 80 feet in length, 5 feet in depth, and 20 feet in width. These scows were placed side by side about 9 feet apart, and connected by four 18″ timbers, extending across both from outside to outside, and firmly bolted thereto. A derrick about 50 feet in height, with legs of timber 12″ square, was erected on the two middle timbers, so that the great weight was distributed uniformly over the two scows. A center beam about 10 feet in length, and very strong, was framed across the top of the derrick, to which two large blocks and falls were attached, to hoist the cylinders into place, and in some cases to help support the column.

The cylinders were allowed to slide through a clamp made of two 12″ timbers, connected by large rods with nuts at each end, on which were notched two friction blocks about 4 feet long, and perpendicular to the clamp. Another clamp was placed above, and the two sets supported on the scows by eight large jack-screws, which served to cant or lift the pile, as circumstances require. The scows were held in position by several large anchors.

The method of using the pneumatic process is as follows: The pile consists of a number of cast-iron cylinders 8 feet in diameter outside, and in 10-foot lengths, one on top of the other, until the desired length is obtained, each cylinder being provided with flanges on the inside for holding them together by means of forty-seven 1¼″ wrought-iron bolts. After the column is landed, another cylinder of cast iron, called the air-lock, is bolted to its top. This air-lock has a top and bottom plate of cast-iron in which are man-holes that can be closed at pleasure by plates with

* Paper read before the Boston Society of Civil Engineers, at the regular meeting, held January, 1881.

hinges opening at the lower sides, and lined with rubber at the joints. In the top and in the diaphragm or bottom plate are placed air-cocks for equalizing pressure, etc.

The air-pump was a Burleigh compressor, which I got at the East River Bridge, N. Y., which proved just competent for the work. I sometimes regretted that I had not a larger pump, but it proved quite sufficient.

A pipe conveyed the air into a receiver, where it was cooled before it entered the column. The lower man-hole is then closed, and the air forced into the column. With the first stroke of the pumps the operation of compressing the air commences, and as this pressure increases it forces the water out through the open bottom. This continues until the pressure of air equals that due to the head of water outside the column, and the water has all been forced outside. The workmen then enter the air-lock, and, closing the upper man-hole, a cock is opened in the lower diaphragm and the compressed air from below is admitted. When the pressure has become equalized, the lower man-hole plate falls open, and the men pass down on a ladder (of ropes) to the bed of the river, to excavate the material in the column. If it is hard, it is raised in canvas bags to the air-lock, by means of a drum, the shaft of which passes through stuffing-boxes to the outside, where it is worked by hand. When the column has been entirely cleared down to the bottom, the workmen ascend into the air-lock, and, closing the lower valve, the compressed air in the air-lock is allowed to escape, the upper man-hole plate falls open, the men pass out, and the bags of material are removed.

Men are then stationed at the hoisting apparatus, and the cock in the 5-inch blow-off pipe, curved at the top, is opened, and the compressed air in the column allowed to escape quickly; the weight is thus suddenly restored with an effect similar to a blow, while, at the same time, the rapid in-rush of water under the bottom causes a complete scouring of the material at and under the sharp edge of the column, so that it sinks to a considerable depth, frequently 8 or 10 feet.

The friction of the outside of the column against the material through which it passes is greatly diminished by the current of water passing along its surface on its way down to the inside.

If no bowlders are met, the column will continue to settle quite rapidly during the time the air is escaping, and afterward until the material has stopped scouring under the edges, and has compacted itself, under the pressure of the water, hard enough to sustain the weight of the column.

When bowlders or other obstructions are met with, the column stops, and then is recharged with air. The workmen descend and remove the obstruction, and the process already described is repeated. In this manner columns may be sunk to any required depth, even to more than 100 feet. The greatest depth below the surface of the water in our case was 84 feet. The pressure due to this depth is about 45 lbs. to a square inch over the atmospheric pressure, or with the latter added, 60 lbs.; but this was sometimes a little increased to drive out the water through the compacted material around the outside of the column.

In the case of the deepest piers, two sets of clamps, with their friction blocks, were used, and in every case a diaphragm, usually of wrought-iron, with a man-hole in the center, about 2 feet square, was bolted in at the top of the bottom section; this was to prevent the column going too far when let go the first time, for, if it gets out of plumb, it is difficult to restore it; and it was also used to hold the ballast of stone, which was usually put in the second section. Diaphragms of wood, one foot thick, were usually laid on the flanges at each alternate section, for the purpose of holding the ballast or load which was used to prevent the column from popping up when the pressure was high. This filling of stone was at last used to lay in cement in the final filling of the column.

After a column had reached the requisite depth it was cleaned out, and the sealing commenced; it was then perfectly adjusted to the line and grade, and held in position by the clamps and plant. The pressure is kept up so that no water could enter, and cement laid over the bottom, in a thickness of 3 inches, and this was repeated as fast as it set, until (in the deep piers) some 2½ feet in thickness was laid, the pressure being kept up all this time —perhaps forty-eight hours. The pressure was then let off, the air-lock taken off, and men went down and commenced filling in cement concrete of the stone used above for weight when settling. In this manner, with a lining of inch creosoted boards on the outside, to admit of contraction of column when exposed to cold, the masonry was carried to within 18 inches of the top, and smoothed off to receive the cap-stone, which was about 18 inches in thickness, of granite nicely dressed, and extended about 3 inches above top of the iron column. The cap was of cast-iron, about 3 inches in thickness, with a flange 6 inches in depth, weighing about four tons, which was laid on top of the cap-stones in a thin coating of cement.

The wrought-iron spans, 155 feet in length, were each erected on two large scows, and floated to their places and landed without any difficulty. The only accident that occured was in sinking one of the deep piles, when the top of the air-lock blew off, resulting in the death of five persons who were in the cylinder at the time, and was probably caused by a strain or flaw in the casting, or perhaps by an overstrain in the bolts of the flanges.

The bridge was originally contemplated to be entirely of iron; but afterwards, with the view to economy (?), it was decided to put spans of wood and trestles at the ends; also the guard piers for the draw were put on wooden piles, which were creosoted.

I ought not to close my description and remarks without an acknowledgement of my indebtedness to Mr. W. G. Coolidge, of Chicago, Ill., and Mr. Job Abbott, of Canton, O., for their valuable advice; the first in the matter of the substructure, and the latter of the superstructure.

In this connection I would like to call your attention to a draw or pivot pier in the Somerset bridge, opposite the village of Somerset, in the same river, which I built in 1866, about fourteen years ago. There is nothing very peculiar about it, except perhaps the pivot or draw pier, which was built in a caisson on a grillage about 5 feet in thickness.

Piles were driven about 2 feet apart centers, and cut off at a level of bottom of the river, in about 36 feet of water. The caisson built on shore was then floated over them, guide piles driven, and the masonry built up within the caisson, which was kept in position by the guide piles until it reached the bottom.

After the completion of the pier, it was ballasted with copper slag from Taunton, which made an effectual protection against the ravages of the *teredo*, which is abundant in this river. It is an entirely successful structure, having withstood the blows of vessels and trains for fourteen years, without showing any indication of change. Two years ago the pier was raised about 3 feet, a heavy drum admitting of it, which brings all the iron work at the center of the draw above the highest tides.

I see no reason why this pier may not stand for centuries if the worms do not penetrate the copper slag, and attack the grillage.

The piles of this bridge were creosoted, but the worms have worked where the piles were pricked with cant hooks, and fitted for driving, so that it has been necessary to renew some for a few years past, until this year we shall have to renew about the last of the original piles.

We have the usual plant for creosoting, but the timber has varied very much, some being quite green, while other has been dry. I am satisfied that worms do not enjoy eating the creosote, still they work in close proximity to it. In Europe, I have been told, they have succeeded better than we in the penetration of the "creosote of commerce"—product of coal tar; if so, they must get better results.

In response to several inquiries made at the time the above paper was read, the President, has obtained the following from Mr. Geo. S. Morrill, engineer of the Old Colony Railroad, who was Mr. Winslow's assistant in building the bridge:

"That the tidal currents of Taunton River were, perhaps, four to five miles per hour, and that there was no perceptible scour at the bottom.

"That the bottom was usually of mud, overlying gravel and coarse stones, making almost a hard pan, and that in some cases the cylinders, in order to secure as much penetration for stability as possible, went to rock, which was a sort of slate.

"In the case of one pier, the two legs were of unequal length, one resting in the hard pan, the other going some 20 feet further through the coarse material into sand, and stopping in the sand. The longest leg in the piers of the bridge was the one here alluded to, and some 85 feet long. The two cylinders in the piers were placed about 21 feet apart, center to center.

"That he had never estimated the cost per foot of sinking the cylinders; that the company commenced the work, and, after sinking several, the remainder of the work was let by contract.

"That at the time the air-lock was blown off and several men were killed, some of those within the cylinder escaped with slight injury, being again at work in a few days. Those workmen who were exposed to the force of the escaping air, that is, straddling the holes through which men and material passed up, were either blown against some projecting parts of the various floors, or thrown out of the cylinder, falling into the water, and thus were killed; while those who were protected by some projection, and out of the way of the outgoing current of escaping air, suffered little injury.

"It seems, then, that the sudden expansion of the air within the body or the lungs was not fatal or particularly injurious to the men, but that the deaths were due to being violently thrown against some obstacle by the force of the released air."

STATEMENT,

SHOWING THE RANK, THE DUTIES AND THE ADDRESSES OF

THE OFFICERS OF THE CORPS OF ENGINEERS,

UNITED STATES ARMY.

JANUARY, 1881.

BRIGADIER GENERAL AND CHIEF OF ENGINEERS.

HORATIO G. WRIGHT, Bvt. Major General, WASHINGTON, D. C.—In command of the Corps of Engineers and in charge of the Engineer Department. Charged with the supervision of such matters connected with construction of jetties and other works at South Pass, Mississippi River, as require the action of the Secretary of War.

Member of Joint Commission to supervise the construction of the Washington National Monument. Member of Light-house Board. Directed by the President to co-operate with the authorities of the State of New York in examining and deciding upon exterior pier and bulkhead lines on Hudson River from State dam at Troy to the city of Hudson.

COLONELS.

HENRY W. BENHAM, Bvt. Major General, 7 WAVERLEY PLACE, NEW YORK CITY.—In charge of the construction of Forts Winthrop, Independence and Warren, Mass.; work on Long Island Head, and field works on the coast from Provincetown to Gloucester, Mass.; forts Montgomery, Columbus, Wood and Hamilton and additional batteries, Castle Williams, South Battery Governor's Island, Mortar Battery at Fort Hamilton, N. Y., and fort at Sandy Hook, N. J.

Member of Board of Engineers to examine candidates for promotion in the Corps of Engineers.

JOHN N. MACOMB, 1,125 GIRARD STREET, PHILADELPHIA, PA.—In charge of the construction of Forts Delaware, Del., and Mifflin, Pa., battery at Finn's Point, N. J., and work opposite Fort Delaware, Del.

In charge of the improvement of the harbors at New Castle and Wilmington, Del., Chester, Pa., and at other places on Delaware River and Bay; Ice-harbor at Marcus Hook, Pa, and of the construction of piers at Lewes, Del.

In charge of the improvement of the Salem River and Cohansey Creek, N. J.; Delaware and Broadkiln rivers, Duck and Mispillian creeks, Del., and Schuylkill River, and Susquehanna River from Richard's Island up, Pa.; and Delaware River below Bridesburg, Pa., and between Bridesburg and Trenton, near Cherry Island flats, and at Schooner Ledge.

In charge of removal of obstructions from the harbor at the Delaware Breakwater.

In charge of the surveys of the Delaware River below League Island, and examination or survey of Rancocas River from the Delaware River to Pemberton, and Absecom Inlet, N. J.; Ice-harbor at the head of Delaware Bay, near Morris Liston's on Reedy Island; Delaware River, Chester and Ridley creeks near outlets in Delaware River, Pa.; Appoquinimink Creek, Del., Saint Jones Creek and Little Creek, in Kent Co., Del., Christiana River, Del., from Delaware Railroad bridge to mouth.

Chairman of Board of Advisory Commission to Board of Harbor Commissioners of Philadelphia.

Z. B. TOWER, Bvt. Major-General, ARMY BUILDING, N. Y. CITY.—President of the Board of Engineers.

Member of Board of Engineers on improvement of Charleston Harbor, S. C.; of Board of Engineers on Improvement of Pass Cavallo Inlet, Aransas Pass and Bay, and entrance to Galveston Harbor, Tex.; of Board of Engineers upon the further improvement of Savannah River and Harbor, Ga., and of Board of Engineers to examine candidates for promotion in the Corps of Engineers.

JOHN NEWTON, Bvt. Major General, ARMY BUILDING, N. Y. CITY.—Member of the Board of Engineers.

In charge of the improvement of the Harbors at Rondout and Port Chester, N. Y., and of Echo Harbor, N. Y.

In charge of the improvement of the Hudson River, Harlem River, Flushing, Sheepshead and Canarsie bays, East Chester and Newtown creeks, and Buttermilk channel, N. Y., South and Raritan rivers and Cheesequakes creek, N. J.; removal of obstructions in the East River, including Hell Gate, N. Y.

In charge of the examination or survey of New Rochelle Harbor, N. Y., from City Island to town of New Rochelle, Bronx River from its mouth in the city of New York, Hempstead Harbor and Sumpawaums Inlet, Long Island, N. Y.; for water-way connecting Jamaica Bay with Cornell's Landing, N. Y.; of Gowanus Bay and Patchogue River, N. Y.

In charge of the manufacture and supply of Mastic, and examination of Brooklyn Bridge, N. Y.

Member of Board of Engineers on improvement of Charleston Harbor, S. C.; of Board of Engineers on improvement of Pass Cavallo Inlet, Aransas Pass and Bay, and entrance to Galveston Harbor, Tex.; of Board of Engineers upon the further improvement of Savannah River and Harbor, Ga., and of Court of Inquiry upon Lieutenant Colonel Warren's conduct as Major-General commanding the Fifth Army Corps at battle of Five Forks, Va., on April 1, 1865. Directed by the President to co-operate with the authorities of the State of New York in examining and deciding upon exterior pier and bulkhead lines on Hudson River from State dam at Troy to the city of Hudson.

GEORGE THOM, Bvt. Brig. General, BOX 1,089, PORTLAND, ME.—In charge of the improvement of the Harbors at Belfast, Portland, Rockland, Richmond's Island, Me., Portsmouth, N. H., Newburyport, Boston (including sea-walls on Point Allerton, Great Brewster Island, Lovells' Island, Long Island Head, Rainsford Island, and Deer Island, also channel leading to Nantasket Beach), Plymouth, Provincetown, and Scituate, Mass.

In charge of the improvement of the Rivers Cathance, Back (at "Gut" opposite Bath), and Kennebunk, Me., Exeter, N. H., Merrimac, Mystic and Charles, Mass., Lubec Channel, Me., and of Lake Winnipiseogee, N. H.

LIEUTENANT COLONELS.

WILLIAM F. RAYNOLDS, Bvt. Brig. General, 532 WALNUT

STREET, PHILADELPHIA, PA.—On detached service; Engineer 4th Light house District.

CHARLES S. STEWART, SAN FRACISCO, CAL.—In charge of the construction of Fortifications at Fort Point, Point San Jose, and Angel Island, in San Francisco Bay, and at San Diego, Cal.

In charge of the improvement of the Harbor at San Diego, Cal. Senior Member of Board of Engineers for the Pacific Coast.

CHARLES E. BLUNT, Bvt. Colonel, PORTLAND, ME.—In charge of the construction of Forts Gorges, Preble, Scammel, Popham, Knox, and Battery at Portland Head, Me., and forts Constitution and McClary, and batteries on Jerry's Point and Gerrish's Island, Portsmouth Harbor, N. H.

Engineer 1st Light-house District.

JAMES C. DUANE, Bvt. Brig. General, P. O. BOX 4,073, NEW YORK CITY.—On detached service; Engineer 2d and 3d Light-house districts.

ROBERT S. WILLIAMSON, SAN FRANCISCO, CAL.—Member of Board of Engineers for the Pacific Coast.

Engineer 12th Lighthouse District.

QUINCY A. GILLMORE, Bvt. Major General, P. O. Box 1,647, NEW YORK CITY.—In charge of the construction of Forts Wadsworth, Tompkins and its batteries, N. Y., Monroe and Wool, Va., Macon and Caswell, N. C., Moultrie, Sumter, Johnson, and Castle Pinckney, S. C., Jackson and Pulaski, Ga., Clinch and Marion, Fla.

In charge of the improvement of the Harbors at Charleston, S. C., Savannah, Darien, and Brunswick, Ga.

In charge of the improvement of Ashley River and Sullivan's Island, S. C., of the bar at the mouth of St. John's River, and of the inside passage between Fernandina and St. John's, Fla., Volusia Bar, Fla., Cumberland Sound, Fla. and Ga., Savannah River and St. Augustine Creek, Ga.

In charge of the examination or survey of Edisto and Santchehatchie rivers; for reopening of Santee Canal; Savannah River from Savannah to Augusta, Ga.; opening of steamboat communication from the Saint John's River, Fla., by way of Topokalija Lake, to Charlotte Harbor or Pease Creek.

Member of Board of Engineers on improvement of Charleston Harbor, S. C.; of Board of Engineers on improvement of Pass Cavallo Inlet, Aransas Pass and Bay and entrance to Galveston Harbor, Tex.; of Board of Engineers upon the further improvement of Savannah River and Harbor, Ga. Member and President of "The Mississippi River Commission" created by Act of Congress approved June 28, 1879.

THOS. LINCOLN CASEY, Bvt. Colonel, WASHINGTON, D. C.—In charge of Public Buildings and Grounds and certain Public works in the District of Columbia; of the construction of the building for the State, War and Navy departments; of the Washington Aqueduct, and the construction of the Washington National Monument.

Member of Advisory Board to make and carry out changes and alterations in heating, lighting and ventilating the Hall of the House of Representatives and of Board to supervise the fire-proof reconstruction of the Patent Office Building.

NATHANIEL MICHLER, Bvt. Brig. General, ARMY BUILDING, N. Y. CITY.—In charge of the improvement of the Harbors of Plattsburgh, N. Y., Burlington and Swanton, Vt.

In charge of the improvement of the Shrewsbury, Rahway, Elizabeth, Manasquan and Passaic rivers, and Woodbridge Creek, N. J., and Otter Creek, Vt.; and of improvement of channel between Staten Island and New Jersey.

In charge of the removal of the wreck of bark "Samarang," near Sandy Hook, N. J.

In charge of the examination or survey of Mattawan Creek from Raritan Bay channel to Central Railroad bridge; Shark River, Perth and South Amboy to main ship-channel off Great Kills Raritan Bay, N. J., and Ticonderoga River, N. Y.

JOHN G. PARKE, Bvt. Major General, WASHINGTON, D. C.—In charge of the 3d Division, Office of the Chief of Engineers.

GOUVERNEUR K. WARREN, Bvt. Major General, NEWPORT, R. I.—In charge of the construction of Defenses of New Bedford Harbor, Mass., and Narragansett Bay, R. I.

In charge of the improvement of the Harbors of Nantucket, Hyannis and Wood's Holl, Mass., and Block Island, R. I.

In charge of the improvement of the Rivers Taunton, Mass., Pawtucket and Providence, R. I., and Connecticut, Mass. and Conn.; Narragansett Bay, R. I., and Little Narragansett Bay, R. I. and Conn.

In charge of the examination or survey of Wareham Harbor, Mass., and Potowomut River, R. I.

Member of Board of Engineers upon bridging the Ohio River.

GEORGE H. MENDELL, Bvt. Colonel, SAN FRANCISCO, CAL.—In charge of the construction of Fort on Alcatraz Island, and of defenses at Lime Point, San Francisco Bay.

In charge of the improvement of the Harbor at Oakland, Cal., and of the construction of the breakwater at Wilmington Harbor, Cal.

In charge of the improvement of Sacramento and San Joaquin Rivers and Petaluma Creek, Cal.

In charge of the examination or survey of Humboldt Bay, Cal.; to devise a system of works to prevent further injury to navigable waters of California from the débris from the mines, with estimates of the cost of such works.

To investigate causes tending to decrease depth of water and diminish the commercial value of San Francisco Harbor.

Member of Board of Engineers for the Pacific Coast and of Advisory Board of Commissioners on the Harbor Lines of San Francisco.

HENRY L. ABBOT, Bvt. Brig. General, WHITESTONE, N. Y.—Member of The Board of Engineers.

In charge of the construction of Fort Schuyler and fort at Willets Point, N. Y., and of experiments with torpedoes.

Commanding Engineer Depot and Post of Willets Point, and Battalion of Engineers.

Member of Board of Engineers to examine candidates for promotion in the Corps of Engineers.

MAJORS.

WILLIAM P. CRAIGHILL, Bvt. Lieut. Colonel, 70 SARATOGA STREET, BALTIMORE, MD.—In charge of the construction of Defenses of Baltimore, Md., and Washington, D. C.

In charge of the improvement of the Harbors at Baltimore, Annapolis, Queenstown, and of the inner-harbor at Cambridge, Md., and Onancock Harbor, Va.

In charge of the improvement of the channel of Susquehanna River above and below Havre de Grace, and work at the Fishing Battery light station, near Spesutia Island; of the Chester, Wicomico, Pocomoke, Elk, Northeast and Choptank rivers, Treadhaven and Secretary, Creeks, Md.; Broad Creek, Del., James and Appomattox rivers, Va., New River, Va. and W. Va., Great Kanawha, Shenandoah and Elk rivers W. Va., and Cape Fear River, N. C.

Member of Board of Engineers on Davis Island Dam, Ohio River.

CYRUS B. COMSTOCK, Bvt. Brig. General, DETROIT, MICH.—In charge of the survey of Northern and Northwestern Lakes.

Member of "The Mississippi River Commission" created by Act of Congress, approved June 28, 1879.

Member of Board of Engineers to examine candidates for promotion in the Corps of Engineers.

GODFREY WEITZEL, Bvt. Major General, DETROIT, MICH.—In charge of the construction of harbor of refuge on Lake Huron.

In charge of the Louisville and Portland Canal and of St. Mary's Falls Canal; of the improvement of the Falls of the Ohio, and of the Rivers St. Mary and Detroit, Mich.

Member of Board of Engineers upon bridging the Ohio River; of Board of Engineers on Davis Island Dam, Ohio River.

Engineer 11th Light-house District.

ORLANDO M. POE, Bvt. Brig. General, WASHINGTON, D. C.—On detached service; Aide-de-Camp on the personal staff of the General of the Army, with the rank of Colonel.

Member of Light-house Board.

DAVID C. HOUSTON., Bvt. Colonel, MILWAUKEE, WIS.—In charge of the improvement of the Harbors at Milwaukee, Racine and Kenosha, Wis., and Waukegan, Ill.

In charge of the improvement of the Rivers Fox and Wisconsin.

GEORGE H. ELLIOT, WASHINGTON, D. C.—In charge of the 1st and 2d Divisions, Office of the Chief of Engineers.

HENRY M. ROBERT, MILWAUKEE, WIS.—In charge of the improvement of the Harbors at Ontonagon, Eagle Harbor, Marquette, and harbor of refuge at Grand Marias, Mich., Lake Superior; Menomonee, Green Bay, Ahnepee, Two Rivers, Manitowoc, Sheboygan, Port Washington, Manistique, and harbor of refuge at entrance to Sturgeon Bay Canal, Lake Michigan.

In charge of the examination or survey for a harbor on Lake Michigan at Kewaunee, Wis.

Advisory Engineer for improvement of Kewaunee Harbor, Wis.

WILLIAM E. MERRILL, Bvt. Colonel, 82 WEST THIRD STREET, CINCINNATI, O.—In charge of the construction of Ice-harbors at or near Cincinnati, and at mouth of Muskingum River, Ohio.

In charge of improvement of the Rivers Ohio and Monongahela, and Allegheny, Pa.

In charge of examination or survey for Ice-harbor, Bellaire, Ohio; Youghiogheny River, to begin at its mouth at McKeesport and end at Connellsville, Pa.; Ohio River at head of Hurricane Island and Elizabethtown, Ill.; Red Bank Creek, Pa., from its mouth on Allegheny River to Brookville; for the construction of two ice-breakers in Ohio River near West Virginia shore, and below the railroad bridge crossing said river at Parkersburg, and Ice-harbor at Point Pleasant, W. Va.

Member of Board of Engineers upon bridging the Ohio River, and associate member of the Board of Engineers during the consideration of plans for the improvement of the Ohio River proposed by Mr. Herman Haupt, C. E., member of Board of Engineers on Davis Island Dam, Ohio River.

Engineer 14th Light-house District.

WALTER MCFARLAND, OSWEGO, N. Y.—In charge of the construction of Fort Wayne, Mich., and Forts Porter, Ontario and Niagara, N. Y.

In charge of the improvement of the harbors at Dunkirk and Buffalo, on Lake Erie; Olcott, Oak Orchard, Charlotte, Pultneyville, Big Sodus, Little Sodus, Oswego and Wilson, on Lake Ontario, and Ogdensburg and Waddington, on the River St. Lawrence.

In charge of the examination or survey of Ogdensburg Harbor, Niagara River at mouth of Tonawanda Creek, Port Day above Falls of Niagara, and Grass River at Massena, N. Y.

On temporary duty with the Torpedo School at Willett's Point, New York Harbor.

ORVILLE E. BABCOCK, Bvt. Brig. General, 1 COURTLAND STREET, BALTIMORE, MD.—On detached service; engineer 5th Light-house District.

JOHN M. WILSON, Bvt. Colonel, SCOFIELD BLOCK, CLEVELAND, OHIO.—In charge of the improvement of the harbors at Port Clinton, Monroe, Toledo, Sandusky, Huron, Vermillion, mouth of Black River, Rocky River, Cleveland, Fairport, Ashtabula, Conneaut and Erie, on Lake Erie.

In charge of the improvement of Sandusky River, Ohio.

In charge of the survey to ascertain the practicability and cost of construction of a ship-canal from Lake Erie, by the Maumee and Wabash Valleys, in the bed of the old Wabash and Erie Canal, or with any variation therefrom that may prove feasible, to the navigable waters of Wabash River; survey and estimate of cost of a similar canal from Junction City, on the Wabash and Erie Canal, to the Ohio River, by way of the Miami and Erie Canal, or any variation in route to produce the most practical and least expensive ship-canal from Lake Erie to the navigable waters of the Ohio River by the above routes.

FRANKLIN HARWOOD, Bvt. Lieut. Colonel, DETROIT, MICH.—In charge of the improvement of the harbors at Cheboygan, Au Sable, and Sebewaing, on Lake Huron, harbor of Alpena at Thunder Bay, harbors at Charlevoix, Frankfort, Manistee, Ludington, Pentwater, White River, Muskegon, Grand Haven, Black Lake, Saugatuck, South Haven, and St. Joseph, and harbor of refuge at Portage Lake, on Lake Michigan.

In charge of the improvement of Saginaw and St. Joseph rivers, Mich.

In charge of the examination or survey of Grand River below Grand Rapids, Swan Creek, Lake Saint Clair, and Empire Bay.

In charge of St. Clair Flats Canal.

JOHN W. BARLOW, Bvt. Lieut. Colonel, NEW LONDON, CONN.—In charge of Forts Griswold and Hale, and the construction of Fort Trumbull, Conn.

In charge of the improvement of the harbors of Stonington, New Haven, Bridgeport, Milford, Southport and Norwalk, Conn., and Port Jefferson, N. Y.; and of the construction of breakwater at New Haven, Conn.

In charge of the improvement of the Rivers Housatonic and Thames, Conn.

In charge of the examination or survey for opening channel between Lloyd's Harbor and Cold Spring Bay, N. Y.

PETER C. HAINS, Bvt. Lieut. Colonel, CHARLESTON, S. C.—On detached service; Engineer 6th Light-house District.

FRANCIS U. FARQUHAR, Bvt. Lieut. Colonel, OFFICE OF THE LIGHT-HOUSE BOARD, WASHINGTON, D. C.—On detached service; Engineer Secretary to Light-house Board.

GEORGE L. GILLESPIE, Bvt. Lieut. Colonel, PORTLAND, OR.—In charge of works of defense at the mouth of the Columbia River.

In charge of the improvement of the harbor at Coos Bay, and entrance to Yaquina Bay, Or.

In charge of the construction of the canal around the cascades of the Columbia River, and the improvement of the rivers Willamette, Yamhill, Columbia, Snake, Skagit, Cowlitz, and mouth of Coquille River; and of Lower Clearwater River, Idaho.

In charge of examination or survey of Columbia River at the Dalles.

Associate Member of Board of Engineers for Pacific Coast while considering the Harbor of Refuge between the Straits of Fuca and San Francisco, Cal., and the canal at the Cascades of the Columbia River, Oregon.

Engineer 13th Light-house District.

CHARLES R. SUTER, 1,351 WASHINGTON AVENUE, ST. LOUIS, MO.—In charge of the improvement of the rivers Mississippi, Missouri and Arkansas—removal of snags, etc.; and of the Missouri River at the following localities: St. Charles, Cedar City, Glasgow, Lexington, Kansas City, Fort Leavenworth, Atchison, St. Joseph, Brownville, Nebraska City, Eastport, Plattsmouth, Omaha, Council Bluffs, Sioux City and Vermillion, and of Gasconade River, and the Arkansas River between Fort Smith, Ark., and Wichita, Kan., and at Pine Bluff.

In charge of the survey of the Missouri River from its mouth to Sioux City, Ia., and to Fort Benton, Mont., and at Boonville, Yankton and Niobrara, and from Tuque Creek to one mile west of Charrette Creek, Mo., and at Brunswick, Mo., with reference to boat-landing; mouth of Grand River.

Member of "The Mississippi River Commission," created by Act of Congress approved June 28, 1879.

Engineer 15th Light-house District.

JARED A. SMITH, CARE OF DREXEL, HARJES & CO., BOULEVARD HAUSSMANN, PARIS, FRANCE.—On leave of absence.

SAMUEL M. MANSFIELD, Bvt. Lieut. Colonel, GALVESTON, TEX.—In charge of the improvement of the Harbors at Galveston and Brazos Santiago, Tex.

In charge of the improvement of ship channel in Galveston Bay, Pass Cavallo, Aransas Pass and Bay up to Rockport and Corpus Christi, Brazos River, of the narrows above Orange on Sabine River, and deepening the channel at mouth of said river; deepening channel at mouth of Trinity River, and removal of obstructions for Liberty; deepening of channel at mouth of Neches River, and removal of obstructions to Beaumont, and the protection of river-bank at Fort Brown, Tex.

In charge of the examination or survey of Buffalo Bayou, Tex., from Simm's Bayou to the mouth of White Oak Bayou at Houston.

WILLIAM J. TWINING, COLUMBIA BUILDING, FOUR-AND-A-HALF STREET, WASHINGTON, D. C.—On detached service; Engineer Commissioner of the District of Columbia.

WILLIAM R. KING, CHATTANOOGA, TENN.—In charge of the improvement of the Rivers Tennessee, Tenn. and Ala.; Cumberland above and below Nashville, Ky. and Tenn.; Hiawassee, Caney Fork, Obey's, Duck, French Broad, and Clinch, Tenn.; Oostenaula, Coosawattee, Etowah, Oconee and Ocmulgee, Ga: and Coosa, Ga. and Ala.

In charge of the examination or survey of Clinch River, in counties of Hancock, Hawkins and Claiborne, Tenn., and Scott and Russell, Va.; Powell River, in counties of Hancock and Claiborne, Tenn., and Lee, Va.; Holston, River in counties of Sullivan, Hawkins, Grainger and Hamblen, Tenn., and Washington and Scott, Va.; headwaters of the Savannah River, in connection with the headwaters of Hiawassee and Tennessee rivers, with view of ascertaining if a summit level can be secured to unite them by a canal; South Fork of Cumberland River, Ky.; Red River from Port Royal, Montgomery County, Tenn., to its mouth.

WM. H. H. BENYAURD, MEMPHIS, TENN.—In charge of the improvement of the harbors at Memphis, Tenn., and Vicksburg, Miss.

In charge of the improvement of the rivers St. Francis, White, L'Anguille, Fourche Le Fève, Saline and Black, Ark., the Ouachitta in La. and Ark., Yazoo in Miss., and Cypress Bayou, La. and Tex.; of mouth of the Red River, La., Upper Red River from Fulton to head of Raft; of the rivers Big Sun Flower, Coldwater and Tallahatchie, Miss., and the Mississippi River at Memphis, Natchez, Vidalia and Vicksburg, and the Big Hatchie River, Tenn.; of removal of raft, snags and other obstructions from Red River, and of closing Tones' Bayou.

In charge of the water-gauges on the Mississippi River and its principal tributaries.

In charge of the examination or survey of bayous Bartholomew and Macon and Tensas River, La.; Saint Francis River from Greenville, and from Greenville, Mo., to the Cairo, Arkansas & Texas Railroad; Currant River from Van Buren, Mo., to its mouth in Arkansas; Harbor at Grand Gulf, Miss.; Obion, South Forked Deer and North Forked Deer Rivers, Tenn.; Cache River, a tributary of White River, and The Bay, a tributary of Saint Francis River, Ark.; Boeuf River, North Louisiana.

CHARLES W. HOWELL, P. O. DRAWER 432, NEW ORLEANS, LA.—In charge of the construction of forts Jackson, St. Philip, Livingston, Pike and Macomb, Tower Dupré, Battery Bienvenue, and Tower at Proctorsville.

In charge of the improvement of the Harbor at New Orleans, La.

In charge of the improvement of the Amite, Vermillion, and Tangipahoa rivers, bayous Terrebonne, Teche and Courtableau, La.; of Sabine Pass and Blue Buck Bar, Tex., and of Pearl River, Miss., and removal of obstructions in Bayou La Fourche, La.

In charge of the surveys for a breakwater in Lake Pontchartrain, La., and the examination or survey of Calcasieu River, bayous Plaquemine, Black, Grand Caillon, Little Caillon, Andre, Fusilier, Grand Lake, Little Lake and Barataria Bay from New Orleans to Grand Pass, Atchafalaya River from Berwick's Bay to mouth of Red River, Bogue Chitto River from its mouth to Franklington, and Bogue Falia from its mouth to 25 miles above Covington, La.; West Pearl River; Pass Manchac and Bayou Manchac, La.; from its mouth to the Mississippi River.

GARRET J. LYDECKER, P. O. DRAWER 132, CHICAGO, ILL.—In charge of improvement of the Harbors at Chicago and Calumet, Ill.

In charge of the improvement of the Illinois River.

CAPTAINS.

AMOS STICKNEY, Bvt. Major, KEOKUK, IA.—In charge of the improvement of the Des Moines Rapids of the Mississippi River.

In charge of operating the Des Moines Rapids Canal.

In temporary charge of the improvement of the Harbors at Michigan City, Ind., and New Buffalo, Mich.

In temporary charge of the improvement of the Rivers Wabash, Ind. and Ill., and White, Ind.

JAMES W. CUYLER, 82 WEST THIRD STREET, CINCINNATI, O.—In charge of the improvement of the Little Kanawha and Guyandotte Rivers, W. Va., the Big Sandy River, W. Va. and Ky., and the Kentucky River, Ky.

In charge of the examination or survey of Tradewater River, Ky.

ALEXANDER MACKENZIE, ROCK ISLAND, ILL.—In charge of the improvement of the Harbors at Fort Madison, Burlington, and Muscatine, Ia., Rock Island, and Galena, Ill.

In charge of the improvement of the Mississippi River, from St. Paul to the mouth of the Illinois River, at Quincy, Ill., Hannibal and Alexandria, Mo.; of Rush Chute, Ia., and the upper Mississippi River and Rock Island Rapids of the Mississippi River, and Galena and Cuivre rivers, and removing bar in Mississippi River, opposite Dubuque, Ia.

In charge of the examination or survey of Mississippi River at Andalusia, Ill., and Louisiana, Mo.

OSWALD H. ERNST, 404 MARKET STREET, ST. LOUIS, MO.—In charge of the improvement of Mississippi River between the mouths of the Illinois and Ohio Rivers, and at Cape Girardeau

and Minton's Point, Mo., and of Osage River in Missouri and Kansas.

In charge of construction of Ice-harbor at St. Louis, Mo.

DAVID P. HEAP, BUFFALO, N. Y.—On detached service; Engineer 10th Light-house District.

WILLIAM LUDLOW, Bvt. Lieut. Colonel, 1,125 GIRARD STREET, PHILADELPHIA, PA.—On duty under the immediate orders of Colonel Macomb.

CHARLES B. PHILLIPS, 59 MAIN STREET, NORFOLK, VA.—In charge of the improvement of the harbors at Norfolk, Va., and Edenton, N. C.

In charge of the improvement of the Blackwater and Nottaway Rivers and Pagan Creek, Va., Neuse, Scuppernong, Pamplico, Yadkin, Trent and Tar rivers, Currituck Sound, Coanjok Bay, North River Bar, N. C., and North Landing River, Va. and N. C.; Waccamaw and Great Pee Dee rivers, S. C.

In charge of the examination or survey of Pocosson and Lillington rivers, Beaufort Harbor, Town Creek and Cape Fear River above Wilmington, N. C.; Georgetown Harbor, Lynch, Wateree and Black rivers, S. C.

Advisory Engineer to National Board of Health in the establishment of a National Quarantine Station in Hampton Roads, Va.

WILLIAM A. JONES, PRESIDIO OF SAN FRANCISCO, SAN FRANCISCO, CAL.—On detached service; Engineer Officer, Military Division of the Pacific and Department of California.

ANDREW N. DAMRELL, Bvt. Major, MOBILE, ALA.—In charge of the construction of Defenses of Mobile and Pensacola, and of fort on Ship Island, Miss.

In charge of the improvement of the Harbors at Pensacola and Cedar Keys, Fla., and Mobile, Ala.

In charge of the improvement of the Rivers Chattahoochee, Appalachicola and Suwannee, Fla., Flint, Ga., Alabama, Ala., Pascagoula and Noxubee, Miss., Warrior and Tombigbee, in Ala. and Miss., and Escambia River, Fla. and Ala.; Appalachicola and Tampa bays, and removal of obstructions in the Choctawhatchee River, Ala. and Fla.

In charge of the examination and survey of the rivers Cahaba and Tallapoosa, Ala.; Finholloway, Chipola, Ocolocknonee and Black rivers, East Bay, Holmes Creek, Aucilla and Wacissa, Fla.

CHARLES J. ALLEN, Bvt. Major, ST. PAUL, MINN.—In charge of the improvement of the harbors at Duluth and Grand Marais, Minn.

In charge of the improvement of the rivers St. Croix, Chippewa, and Minnesota, of the Red River of the North and Entrance to Superior Bay; of the Falls of St. Anthony, and of the Mississippi River above the Falls of St. Anthony.

In charge of the construction of Meeker's Island lock and dam, of dam at Lake Winnibigoshish for reservoirs at headwaters of the Mississippi River, and protection of sand banks on the Chippewa River, Wis.

In charge of the examination of the sources of the rivers Mississippi, St. Croix, Chippewa and Wisconsin, with the view of ascertaining the practicability and cost of creating and maintaining reservoirs, etc., and of headwaters of Rock River, in Wis. and Ill.

In charge of the examination or survey of Snake River, Minn.; Upper Red River of the North, between Fargo, Dak., and Breckinridge, Minn.; Mississippi River at Sauk Rapids, near Saint Cloud, Minn.; Minnesota River, near Belle Plain, with a view to protect the narrow neck of land opposite said village, and prevent injury to navigation of river in Minnesota.

CHARLES W. RAYMOND, WEST POINT, N. Y.—On detached duty at the Military Academy as Instructor of Practical Military Engineering, Military Signaling and Telegraphy, and in command of Company E, Battalion of Engineers.

In charge of construction of Water-works and of new cadets' hospital and extension of Cadet Barracks, West Point, N. Y.

L. COOPER OVERMAN, NASHVILLE, TENN.—On duty under the immediate orders of Major King.

ALEXANDER M. MILLER, WHITESTONE, N. Y.—Commanding Company B, Battalion of Engineers.

MILTON B. ADAMS, ERIE, PA.—On duty under the immediate orders of Major Wilson.

WILLIAM R. LIVERMORE, SAN ANTONIO, TEX.—On detached service; Engineer Officer, Department of Texas.

WILLIAM H. HEUER, 37 UNION ST., NEW ORLEANS, LA.—In charge of the construction of Forts Jefferson and Taylor, Fla.

To report upon the depth and width of a channel secured and maintained by Jetties constructed by James B. Eads at the mouth of the Mississippi River.

Consulting Engineer for the establishment by the National Board of Health of a National Quarantine Station at Ship Island, Miss.

Engineer 7th and 8th Light-house districts.

WILLIAM S. STANTON, FORT OMAHA, OMAHA, NEB.—On detached service; Engineer Officer, Department of the Platte.

THOMAS H. BANDBURY, 1,351 WASHINGTON AVENUE, ST. LOUIS, MO.—On duty under the immediate orders of Major Suter.

JAMES C. POST, P. O. BOX 36, CHARLESTON, S. C.—On duty under the immediate orders of Lieutenant Colonel Gillmore.

Consulting Engineer in the establishment of a National Quarantine Station at Blackbeards Island, Ga., under direction of the National Board of Health, and of the work to be done by its authority in connection with the Quarantine Station established by the city of Charleston, S. C.

JAMES F. GREGORY, 24 HONORE BLOCK, CHICAGO, ILL.—On detached service; Engineer Officer, Military Division of the Missouri.

HENRY M. ADAMS, WASHINGTON, D. C.—In charge of the 4th and 5th Divisions, Office of the Chief of Engineers.

JAMES MERCUR, ASTORIA, N. Y.—On duty under the immediate orders of Colonel Newton.

Recorder of Board of Engineers on improvement of Charleston Harbor, S. C.

CHAS. E. L. B. DAVIS, GALVESTON, TEX.—On duty under the immediate orders of Major Mansfield.

BENJAMIN D. GREENE, DETROIT, MICH.—On temporary duty under the immediate orders of Major Weitzel.

GEORGE M. WHEELER, P. O. LOCK BOX 93, WASHINGTON, D. C.—Temporarily 30 WEST 25TH STREET, NEW YORK CITY.—In charge of Geographical Surveys of the territory west of the 100th meridian. On leave of absence.

JAMES B. QUINN, WHITESTONE, N. Y.—Commanding Company A, Battalion of Engineers.

DANIEL W. LOCKWOOD, P. O. DRAWER 432, NEW ORLEANS, LA.—On duty under the immediate orders of Major Howell.

ERNEST H. RUFFNER, CHARLESTON, KANAWHA COUNTY, W. VA.—In local charge of the improvement of the Great Kanawha River under the immediate orders of Major Craighill.

JOHN C. MALLERY, WHITESTONE, N. Y.—Commanding Company C, Battalion of Engineers.

CLINTON B. SEARS, WEST POINT, N. Y.—On detached service; on duty at the Military Academy as Assistant Professor of Natural and Experimental Philosophy. Engaged in preparation of plans and specifications for a new Astronomical Observatory at West Point.

FIRST LIEUTENANTS.

THOMAS TURTLE, 70 SARATOGA STREET, BALTIMORE, MD.—On duty under the immediate orders of Major Craighill. Member of Board of Engineers on Davis Island Dam, Ohio River.

EDWARD MAGUIRE, P. O. LOCK BOX 2,124, ST. PAUL, MINN.—In charge of the improvement of the Yellowstone River and of the Missouri River above the mouth of the Yellowstone. Engineer Officer, Department of Dakota.

FREDERICK A. MAHAN, P. O. BOX 70, PITTSBURGH, PA.—On duty under the immediate orders of Major Merrill. Member of Board of Engineers on Davis Island Dam, Ohio River.

CHARLES F. POWELL, CASCADE LOCKS, WASCO COUNTY, OREGON.—On duty under the immediate orders of Major Gillespie.

FREDERICK A. HINMAN, 433 BROADWAY, MILWAUKEE, WIS.—On duty under the immediate orders of Major Houston.

ALBERT H. PAYSON, SAN FRANCISCO, CAL.—On duty under the immediate orders of Lieutenant-Colonel Stewart, and of the Board of Engineers for the Pacific Coast.

JOHN G. D. KNIGHT, WEST POINT, N. Y.—On detached service; on duty at the Military Academy as Assistant Professor of Mathematics.

RICHARD L. HOXIE, COLUMBIA BUILDING, FOUR-AND-A-HALF STREET, WASHINGTON, D. C.—On detached service; Assistant to the Engineer Commissioner of the District of Columbia.

WILLIAM L. MARSHALL, ROME, GA.—On duty under the immediate orders of Major King.

JOSEPH H. WILLARD WHITESTONE, N. Y.—Adjutant and Treasurer of the Battalion of Engineers and Post of Willets Point and Signal Officer Post of Willets Point. Commanding Company D, Battalion of Engineers.

ERIC BERGLAND, WEST POINT, N. Y.—On detached service; on duty at the Military Academy as Assistant Professor of Ethics and Law.

PHILIP M. PRICE, PORTLAND, OR.—On duty under the immediate orders of Major Gillespie.

FRANCIS V. GREENE, 1,915 G STREET, N. W., WASHINGTON, D. C.—On detached service; Assistant to the Engineer Commissioner of the District of Columbia.

CARL F. PALFREY, WHIPPLE BARRACKS, PRESCOTT, ARIZ.—On detached service; Engineer Officer, Department of Arizona.

WILLIAM H. BIXBY, CARE OF DREXEL, HARJES & CO., 31 BOULEVARD HAUSSMANN, PARIS, FRANCE.—Élève extérne à l'Ecole des Ponts et Chaussées.

HENRY S. TABER, WEST POINT, N. Y.—On detached Service; on duty at the Military Academy as Assistant Instructor of Practical Military Engineering, and with Company E. Battalion of Engineers. Recruiting officer for the Battalion of Engineers at West Point. Assistant Engineer, West Point water supply. Assistant Director, Post Schools.

WILLIAM T. ROSSELL, PORTLAND, ME.—On duty under the immediate orders of Colonel Thom.

THOMAS N. BAILEY, SANTA FE, N. M.—On detached service; Engineer Officer, District of New Mexico.

THOMAS W. SYMONS, VANCOUVER BARRACKS, VANCOUVER, WASH.—On detached service; Engineer Officer, Department of the Columbia.

SMITH S. LEACH, 2,828 WASHINGTON AVENUE, ST. LOUIS, MO.—On detached service; Secretary and disbursing officer of the "Mississippi River Commission" created by act of Congress approved June 28, 1879.

DAN C. KINGMAN, WEST POINT, N. Y.—On detached service; on duty at the Military Academy as Assistant Professor of Civil and Military Engineering.

EUGENE GRIFFEN, WHITESTONE, N. Y.—Q. M. Battalion of Engineers. A. A. Q. M., A. C. S. and Recruiting Officer, Post of Willets Point

WILLARD YOUNG, WEST POINT, N. Y.—On detached service; on duty at the Military Academy as Acting Assistant Professor of Civil and Military Engineering.

WILLIAM M. BLACK, CHARLESTON, KANAWHA COUNTY, W. VA.—On duty under immediate orders of Major Craighill.

WALTER L. FISK, FORT GEORGE, FLA.—On duty under immediate orders of Lieutenant Colonel Gillmore

Vacancy.

SECOND LIEUTENANTS.

SOLOMON W. ROESSLER, WEST POINT, N. Y.—On detached service; On duty at the Military Academy in Department of Civil and Military Engineering.

GEORGE McC. DERBY, WHITESTONE, N. Y.—On duty with Company B. Battalion of Engineers.

JAMES L. LUSK, WEST POINT, N. Y.—On detached service; on duty at the Military Academy in Departments of Mathematics and Tactics.

FREDERIC V. ABBOT, WHITESTONE, N. Y.—On duty with Company A, Battalion of Engineers.

THOMAS L. CASEY, WHITESTONE, N. Y.—On duty with Company B, Battalion of Engineers.

THEODORE A. BINGHAM, WHITESTONE, N. Y.—On duty with Company C, Battalion of Engineers.

CURTIS McD. TOWNSEND, WHITESTONE, N. Y.—On duty with Company A, Battalion of Engineers.

GUSTAV J. FIEBERGER, WHITESTONE, N. Y.—On duty with Company B, Battalion of Engineers.

ORELIN M. CARTER, WHITESTONE, N. Y.—On duty with Company C, Battalion of Engineers.

GEORGE W. GOSTHALS, WHITESTONE, N. Y.—On duty with Company A, Battalion of Engineers.

U. S. CIVIL ENGINEERS.

S. T. ABERT, 1,907 PENNSYLVANIA AVENUE, WASHINGTON, D. C.—In charge of the improvement of the Harbors at Washington and Georgetown, D. C., and harbor at Breton Bay, Leonardtown, Md.

In charge of the improvement of the rivers Rappahannock, Chickahominy, Mattaponi, Totusky, York, Pamunky, and Staunton, Va., Roanoke, and French Broad, N. C., and Dan River, Va., and N. C.; of channel in Potomac River through flats in front of landing at Mount Vernon; of Nomini and Urbana creeks, Va.

In charge of the examination or surveys of Neabsco Creek, a tributary of the Potomac; Potomac River at mouth of Pohick Creek; mouth of Curtioman Bay, Va.; Nomini River from the ferry to head of tide-water.

M. MEIGS, ROCK ISLAND, ILL.—On duty under immediate orders of Captain Mackenzie

RETIRED OFFICERS.

Brigadier General A. A. HUMPHREYS, Bvt. Major General, S. E. COR. K AND 15TH STREETS, N. W., WASHINGTON, D. C.

Colonel THOMAS J. CRAM, Bvt. Major General, 304 SOUTH 19TH STREET, PHILADELPHIA, PA.

Colonel JOHN G. BARNARD, Bvt. Major General, CLIFTON SPRINGS, N. Y.

Colonel GEORGE W. CULLUM, Bvt. Major General, 315 FIFTH AVENUE, NEW YORK CITY.

Colonel JAMES H. SIMPSON, Bvt. Brigadier General, 2 MONROE STREET, ST. PAUL, MINN.

Lieutenant Colonel LORENZO SITGREAVES, 1,226 F STREET, WASHINGTON, D. C.

Major FREDERICK E. PRIME, Bvt. Colonel, CARE DR. BUELL, LITCHFIELD, CONN.

By command of Brigadier General WRIGHT.

GEORGE H. ELLIOT, Major of Engineers.

THE GOLD MEDAL OF THE BRITISH ROYAL ASTRONOMICAL SOCIETY.

The British Royal Astronomical Society at the late annual meeting awarded the gold medal to Prof. Alex. Möller, Director of the Observatory at Lund, Sweden, for his investigations on the motion of Faye's comet. He began the work 20 years ago, and continued it up to the present time with exceptional care and skill.

GENERAL INTELLIGENCE.

☞ *We solicit and are always pleased to publish in these columns any items of interest that may be furnished us.*

GAS AND WATER.

The Board of Aldermen of Brooklyn, N. Y., have passed a resolution reducing water rates $85,000 a year. The reduction repeals the extra water rates on houses in which more than twelve persons live, and lowers by $1 the rates in all houses of not less than twenty feet front.

Business with the Cope & Maxwell Manufacturing Co., of Hamilton, Ohio, is remarkably good. They are continually adding to their already large works and plant, tools and appliances, to facilitate the filling of the already large number of orders on hand. They are now working, in addition to the day force, a night gang until 10 o'clock at night; and as soon as more workmen can be had, will run all night. They have in hand one pair of compound condensing sewage pumping engines, of 5,000,000 gallons capacity per 24 hours, for the Pullman Car Company at Pullman, Ill.; one pair of condensing plunger pumping engines, of 3,000,000 gallons capacity; one pair of high-pressure plunger pumping engines of 2,000,000 gallons capacity in 24 hours; four large tubular boilers of steel, boiler feed pumps, and all connection pipes complete, for Springfield (Ohio) Water-works; one set of high-pressure plunger pumping engines, of 3,000,000 gallons capacity in 24 hours, for H. C. Frick & Co., of Pittsburgh, Pa., to force water through 10 miles of 12-inch pipe; one high-pressure plunger pumping engine, for the high-service supply of the Cincinnati Water-works; one large power fire pump, for the Friend & Forgey Paper Co., of Franklin, Ohio; one set of five Cornish pumps, complete, with connections; plungers, 12-in. diameter, 8 ft. stroke, for the Moulton Mining Co., of Butte City, Montana. The demand for all regular stock sizes of mining pumps, fire pumps and boiler feed pumps is unprecedented, requiring the works to run to its utmost capacity. The prospect for trade for the future is very flattering indeed, and the tendency of prices is upward, in order to keep pace with the increased price of labor and material. Skilled labor is very much in demand.

ELECTRICITY.

The Long Branch (N. J.) Commissioners have granted the Hussy Electric Company the privilege of laying pipe through Ocean avenue, and it is understood that the avenue will be lighted with electric lights next summer at a less cost than heretofore paid for gas.

STREETS, DRAINAGE, ETC.

A trial of the Barney dumping scow was made on the 4th with a load of garbage taken on at the foot of East Seventeenth street, this city, and dumped about three miles off Coney Island. The scow is built with two hulls, or pontoons, extending her entire length. These are connected at each end by heavy bridges fastened by strong hinges to each of the sections. The hold of the scow is V-shaped, and can be opened at the bottom by raising a latch. As soon as dumped the sections are drawn together again. It is claimed that four men can dump four of the scows in twenty minutes. The trial dumping occupied less than a minute. The scow is 72 feet long by 22 feet wide. It draws 8 feet of water, and carries about 250 tons of garbage.

BRIDGES.

The New York, Pennsylvania & Ohio Railroad bridge across Musquito Creek, near Courtland, O., has been burned.

Messrs. C. J. & N. S. Bates, engineers and contractors, Chicago, Ill., report bridge-building business brisk and improving all the time.

The new bridge of the New York City and Northern Railroad over the Harlem River was crossed lately for the first time by a train of nineteen empty cars.

RAILROADS.

Engineer Abercrombie has begun laying the rails for the double track on the West Jersey Railroad.

The Carson & Colorado Railroad is now completed to a point 88 miles from the Mound House, its starting point in Nevada.

The branch of the Southwest Railroad from Scottsdale, Pa., to Mt. Pleasant is progressing rapidly. The rails are laid to Mt. Pleasant, and trains will be running in a few weeks.

The work of track-laying has commenced on the Oregon side of the Columbia River, above the lower cascades on the O. R. and N. Company's line, between Portland and The Dalles.

DENVER, April 1.—The Denver & New Orleans Railway Company to-day closed contracts for 12,000 tons of English steel rails, sufficient to extend the road from Denver to a point ten miles south of the Arkansas.

The proposed extension of the Connecticut Valley Railroad from Hartford to this city and Holyoke, is said to be now assured. Vice-President Rumrill, of the Boston and Albany Railroad, states that the Boston & Albany has nothing whatever to do with this extension.

All the contracts for the building by the Buffalo, Pittsburgh & Western Railroad of the new line to Buffalo and other extensions have been signed. The contractors —the New York & Pennsylvania Construction Company—will begin work shortly, so that the road will be completed before October 1.

Engineer Robinson, of Ravenna, and his corps of assistants, who have been engaged making a survey for the proposed railroad from Steubenville (Ohio) to Carrolton, reports the snow nine inches deep on the level. He completed his survey to within six miles of Carrolton, where he was compelled, owing to the storm, to abandon the work for the present.

A combination of capitalists, known as the New York, Boston & Western Railway Association, have secured the services of W. E. Pettee, civil engineer, of Lakeville, Conn., to make the reconnoissance and surveys between the Connecticut and Hudson rivers. Mr. Pettee has nearly completed an air-line reconnoissance, and is very sanguine that he will be able to make an extremely favorable report.

Engineer Reno has been surveying a line of road from Youngstown to Akron, O. He refused to state in whose employ he was, or to give the name of the line of road for which he was working. From another source it was learned that this line was surveyed under the direction of the Pittsburgh, Chicago & St. Louis Railroad, and that work would be commenced upon it at an early date.

The recent snow has seriously interfered with the work of the engineers on the new extension of the West Penn Railroad. They have made a survey on the north side of the Conemaugh River and were examining the canal bed on the south side. A corps of B. & O. engineers are also looking out a route to some point. They came down the river on the north side from the terminus of the Cambria Iron Company's road at Coopersdale.

The Texas Western Narrow Gauge, with all rights, franchises and properties, was sold at Galveston on Tuesday to satisfy a judgment received against the road by the Farmers' Loan & Trust Company of New York. It was bought in by Baker & Potts for $100,000 for account of Messrs. Stone, Spofford & Chew. It is thought under the new management the road will be pushed ahead, with Presidia, Del Norte or Eagle Pass as its objective point. Only forty-two of its projected 660 miles are now in operation.

A dispatch from Charleston, S. C., dated the 4th, states that in accordance with a decree of the United States Court, the Spartanburg & Asheville Railroad was sold at Spartanburg to-day to Joseph Walker, representing a committee of bondholders, for $111,000. Col. Coleman, representing the lien creditors, bid $100,000, and Dr. R. M. Smith bid $110,000. It is understood here that the sale was in the interest of the Spartanburg, Union & Columbia Railroad, with which the Asheville road connects at Spartanburg.

At the annual meeting of the stockholders of the Megantic Railway in Bangor, Me., the amended charter was accepted and a company organized with the following officers: John H. Pope, President; Noah Woods, E. R. Burpee and F. A. Wilson, all of Bangor; William B. Ives, T. S. Morey and Donald McFee, all of Sherbrooke, Que., directors; James F. Rawson, Secretary; C. F. Woodward, Treasurer. The company will hereafter be called the International Railway. The President and Messrs. Ives and McFee were appointed Construction Committee. The location of the line will be commenced as soon as the weather will permit.

On September 25, 1880, the Cincinnati & Portsmouth Narrow Gauge Railroad was disposed of at forced sale by the sheriff to Henry Brachmann. The price paid was $83,333.34, and the sale included the franchise, right of way, etc. A deed was recorded March 31 from Henry Brachmann to the "Cincinnati, Georgetown & Portsmouth Railroad Company," the transfer including the right of way through Hamilton, Clermont, Brown, Adams and Scioto counties. The price paid was $150,000 "cash in hand." Twenty miles and a quarter of the road are completed, and the road is in operation to Amelia, Clermont County, or "Cleveland Station." Seventeen miles are graded and ready for ties, running from Amelia to Harrisonville, Brown County. The present sale includes the right of way from a point east of Harrisonville to Georgetown, Brown County, O., and all equipments.

The Fitchburg Railroad Company has contracted for 4,500 tons of steel rails to be delivered for use this season. Gangs of men are now employed in grading and double-tracking west of Fitchburg, and it is expected before the close of the year to have a continuous double track from Boston to Royalston, 73¾ miles, and a piece 7⅝ miles long between Pequoig and Orange. A new survey has been made between Royalston and Baldwinville by which the distance has been shortened a third of a mile, four bridges over Miller's River and five grade-crossings avoided, and the grades reduced from 33 to 18 feet a mile in favor of east-bound freight. In addition to the ten new locomotives recently put upon the road, five first-class passenger and four consolidation engines are contracted for and one is building at the company's shops. During the winter 550 freight cars have been added to the rolling-stock and four new passenger cars will be delivered May 1.

Arrangements are about completed for the widening of the New Brunswick Railway to the standard gauge and the extension of one of its branches to Presque Isle, in Aroostook. This railroad begins at Gibson, on the east bank of the St. John River and directly opposite Fredericton, N. B., and extends to Edmundston, near the Quebec boundary. It has a branch line to Woodstock, where it makes connection with the continental railway system, and another branch to Caribou, on the Aroostook. With its branches it is 190 miles long. It was built with a gauge of 3 feet 6 inches, by an association of New Brunswick capitalists, the chief of whom was Alexander Gibson, a wealthy lumberman. Last fall a syndicate, at the head of which were George Stephen and Donald A. Smith, who are the leading spirits in the Canadian Pacific Company, purchased the road, which they intend this summer to widen and equip in first-class manner. They have also obtained a charter to build an extension to the St. Lawrence, a distance of about 80 miles, and will begin operations on that line at an early day. The object of the company is to provide the shortest possible route over Canadian territory from Montreal to the sea.

The notching of the Hoosac tunnel preparatory to double tracking the Troy and Greenfield railroad and tunnel is being vigorously pushed and will soon be completed. An order for 1,000 tons of steel rails has been sent to the Rensselaer rail mill, Troy, and the work of rolling them will commence next week. With another track in the tunnel, the laying of which will be commenced as soon as the rails arrive, the Troy and Greenfield railroad will have 14 miles of its road double tracked, extending from the Vermont State line to the east entrance of the tunnel, which will cost some $125,000, and the remainder of the State road—about 90 miles—extending to Greenfield, will have another track some time in the summer. There is a bill before the legislature now for an appropriation for that purpose, and it is probable that after the completion of laying the second track in the tunnel the work will be continued through to Greenfield. The management of the State road and Hoosac tunnel is yet undecided. Chief Engineer A. W. Locke is acting manager, and has in contemplation the enlargement of the depot yard at North Adams, made necessary by the increased amount of freight business, and various other improvements. John M. Galvin, of Boston, has in charge the excavation of the air galleries at the central shaft in the tunnel, which was to be completed April 6. The lighting of the tunnel by electricity will not be done at present on account of the great expense.

RIVERS AND HARBORS.

At the request of the Merchants' Association of Baltimore, and others, a bill has been introduced in the Delaware Legislature asking the right of way for a ship canal across the State, anywhere below Appoquinimink Creek. Two charters have already been granted to the Sassafras and the Queenstown routes. Congressman Martin, Governor Hall, and other prominent men of Delaware and Maryland are named as incorporators, and the capital stock is set at $30,000,000.

CANALS.

DOVER, Del., April 6.—The Ship Canal bill passed the Senate to-day, and is now a law.

PORT JERVIS, N. Y., April 6.—A bad break occurred yesterday in the Delaware and Hudson Canal, one mile west of Lackawaxen, Penna. Sixty feet of embankment were washed away, and the canal to the depth of fourteen feet below the bottom was swept out. Navigation will be much delayed.

DAVENPORT, Ia., April 1.—The Illinois and Mississippi River and Canal Improvement Commission held an adjourned meeting at Rock Island yesterday. Arrangements were made for a Northwestern convention, to be held in Davenport May 25. The call, when issued, will invite each Governor of a Northwestern State to appoint ten delegates, each Board of Trade five, and each farmers' club three, to attend this convention. All State officers, United States Senators and Congressmen will be invited. Secretary Windom has already promised to attend if possible. The object of the convention is to appeal to Congress for a speedy extension of the Illinois & Michigan Canal to the Mississippi River, via Hennepin, for the purpose of opening an all-water route from the upper Mississippi to Chicago, the lakes and the Erie Canal.

NEW PROJECTS.

BUFFALO, April 1.—An electric light company has been established here with a capital of $100,000.

The Terre Haute & Merom Railroad Company filed articles in Indianapolis, April 1, for the construction of a narrow-gauge road from Terre Haute to Merom, Sullivan County, a distance of thirty-five miles.

The Humeston & Shenandoah Railroad Company has filed articles of incorporation with the Secretary of State of Iowa. The object is to build a road from Prairieville to Shenandoah, in Page County. Capital, $4,000,000.

A Cedar Rapids despatch says: "Preliminary steps are being taken for the extension of the Chicago, Milwaukee & St. Paul line to Council Bluffs. This city is the present terminus, but the new line will be started from Marion, five miles northwest, to get a more direct route."

The Indiana Coal and Railway Company has filed articles of incorporation. It proposes to build a railroad from Terre Haute, through the counties of Vigo, Clay, Omer, Monroe, Brown and Bartholomew, to Columbus, in the latter county, a distance of eighty miles. The capital stock is placed at $1,500,000.

The certificate of incorporation of the Brighton Pier Navigation Company, which is to build a new iron pier at Coney Island, was filed recently with the Kings County Clerk. The incorporators are John E. Hoffmire, John D. Hoffmire, John Englis, John Englis, Jr., R. Cornell White, John C. Overhiser, Charles E. Brown, C. M. Englis, W. F. Englis and John A. Pease. Its capital stock is $250,000.

Erastus P. Carpenter, President, and Edward Appleton, Chief Engineer of the New York, Boston, Albany & Schenectady Railroad, have filed a profile of the route of the road through Albany County. It will be constructed in connection with the Albany and Greenbush Bridge and will extend from the western terminus of the bridge to Schenectady, and from Albany to New York upon the east side of the Hudson River.

Articles of incorporation have been filed in Denver of the Boulder & Denver Air-Line Railway Company, which proposes the construction of an air-line railroad between Boulder and Denver. This proposed route is to run via Marshall to an intersection with the Denver, Western & Pacific road at or near the point known as Buffalo Hill. The capital stock of the company is $300,000, divided into 3,000 shares of $100 each.

ST. LOUIS, April 1.—Col. J. W. Paramore, of this city, President of the Texas & St. Louis Narrow-Gauge Railroad, has just returned from New York, where he obtained $4,000,000 for the construction of the narrow-gauge road from Texarkana through Arkansas to a point opposite Cairo, Ill. It is expected that the whole road will be completed this year. This line is a link in the great narrow-gauge system which is to connect New York with the city of Mexico, via St. Louis.

The Rio de la Plata Telephone Company, with a capital of $500,000, H. S. Russel, President, was organized in Boston on Friday of last week, to establish exchanges at Buenos Ayres, in the Argentine Republic, and at Montevideo, in Uruguay. The Continental Company retains a majority interest in the Rio de la Plata stock. Concessions for this company for the whole Argentine Republic have been obtained. Buenos Ayres, which has a population of 400,000, will be connected by a twenty-five-mile cable with Montevideo, which has a population of 100,000.

A charter was granted on the 5th inst. by the State of Florida to a company to build a ship canal to connect the Atlantic Ocean with the Gulf of Mexico. The details of the scheme have already been published in ENGINEERING NEWS in connection with the proposed draining of the Everglades. The companies formed for these two great undertakings are virtually the same, and Philadelphia enterprise and capital are at the bottom of them. The draining of the Everglades will reclaim 12,000,000 acres of valuable sugar, cotton and tropical fruit-growing land, and the ship-canal will shorten the distance to New Orleans from all ports on the Atlantic and Europe and lessen the dangers to navigation. The names of the incorporators of the Canal Company are Hamilton Disston, William C. Parsons, William L. Elkins, John L. Hill, Edward Keene, Albert B. Linderman, William H. Wright, Robert E. Rogers, Samuel H. Grey, William S. Stokley, E. H. Protors, A. P. K. Spofford and J. Coryell. The route will be by the way of the Caloosahatchee River, Lake Okeechobee, and thence to the Atlantic Ocean at or near the mouth of the St. Lucie River. The capital stock is $30,000,000. Operations will commence at once. The advance surveying parties left Philadelphia on the 6th inst, for the Everglades. A prospectus will shortly be issued calling the attention of American and European capitalists to the undertaking, and no doubt is expressed that all the capital required will be forthcoming at once.

CONTRACTING, MISCELLANEOUS, ETC.

William Hensley was making dynamite cartridges in the engine house at Heidelberg Slope, Pa., and had a string of them around his neck. The cartridges exploded, tearing him into fragments. William Williams, engineer, was seriously injured. The house was demolished and the machinery and hoisting apparatus destroyed.

Since the ice has become insecure, workmen on the St. Lawrence Tunnel at Montreal have been prosecuting their boring operations on the Hochelaga side of the river. They have succeeded in striking rock, similar in quality to that found in the bed of the river, and this leaves no doubt in the minds of the engineers that the same quality of rock runs all the way across the St. Lawrence, and assures the perfect practicability of the tunnel.

GOOD NEWS FOR NIHILISTS, MINERS AND RAILWAY CONTRACTORS.—So far as these professions are followed in England, there will be great cause for rejoicing among them over the refusal of an application to prolong the patent at present enjoyed by Nobel's Explosives Company. The marvelous power of this explosive has caused it to be largely used. Nothing but the enormous price has hindered it from coming into more general use, and when the Cornwall miners learned that an application would shortly be made for the renewal of the patent, they resolved on opposing the demand, on the ground that excessive profits had already been realized. The original capital had expanded from £15,000 into £232,000, and the good will of the company was in addition valued at £120,000. The dividends had grown with equal speed, and out of the profits there had been formed a reserve of £50,000. The application was defeated.